HOUSING EXPORTS

THE HOUSING MARKET IN THE UNITED KINGDOM

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Contents

			Page
1		**Introduction to the country**	**1**
	1.1	Geography	1
	1.2	Demographics	1
	1.3	State of the economy	1
	1.4	Political overview	2
2		**Characteristics of the housing market**	**3**
	2.1	**Market overview**	**3**
		2.1.1 Number of households and dwelling types	3
		2.1.2 Household types	5
		2.1.3 Tenure patterns	6
		2.1.4 Consumer requirements	8
	2.2	**New build housing**	**10**
		2.2.1 Demand	10
		2.2.2 Forecasts and trends	11
		2.2.3 Profile of UK housebuilders	13
		2.2.4 Prices	17
		2.2.5 Land supply	22
	2.3	**Housing technology**	**22**
		2.3.1 System types and market share	22
		2.3.2 Trends in timber construction	25
		2.3.3 Major domestic firms	27
		2.3.4 Major foreign competition	27
	2.4	**Major challenges facing UK Housing**	**28**
		2.4.1 Background	28
		2.4.2 Pressure points	29
		2.4.3 Government policy	30
		2.4.4 Government initiatives	31
		2.4.5 Contact points	34
3		**Building technology and standards**	**37**
	3.1	Building materials, products and approvals	37
	3.2	Technical standards	37
	3.3	Design standards	38
	3.4	Warranty schemes	38
4		**Business Environment**	**40**
	4.1	Key issues concerning imported housing and products to the UK	40
	4.2	Trading relationships	41
	4.3	Recommended market entry strategies for Canadian housing companies	42

Annex 1: Typical performance specification for timber frame use in the UK

1 Introduction to the country

1.1 Geography

The United Kingdom lies near the North Atlantic sea-lanes approximately 35 km from France to which it is now linked by tunnel under the English Channel.

It has a number of islands including the northern one-sixth of the island of Ireland.

It has a total land mass of 244,820 sq. km mostly made up of rugged hills and low mountains, levelling to rolling plains in the East and South East.

It has 12,429 km of coastline.

It has an excellent transport infrastructure with over 372,00 km of roads, around 10% of which are motorways (expressways).

Around 25% of the land mass is arable, 46% pasture, 10% woodland and 19% other.

The climate is temperate moderated by prevailing South West winds over the North Atlantic Current.

1.2 Demographics

The United Kingdom has a population of around 59 million, 38 million of which are aged between 15-64. Ethnic groups represented are English 81.5%, Scottish 9.6%, Irish 2.4%, Welsh 1.9%, Ulster 1.8%, West Indian, Indian, Pakistani, and other 2.8%. The population growth rate is 0.24% per annum.

A wide array of religions are represented including: Anglican 27 million, Roman Catholic 9 million, Muslim 1 million, Presbyterian 800,000, Methodist 760,000, Sikh 400,000, Hindu 350,000, Jewish 300,000. English is the main language with Welsh and a Scottish form of Gaelic also being spoken in the regions.

1.3 State of the economy[1]

The UK is one of the world's great trading powers and financial centres, and its essentially capitalistic economy ranks among the four largest in Western Europe. Over the past two decades the government has greatly reduced public ownership and contained the growth of social welfare programs. Agriculture is intensive, highly mechanised, and efficient by European standards, producing about 60% of food needs with only 1% of the labour force. The UK has large coal, natural gas, and oil reserves; primary energy production accounts for 10% of GDP, one of the highest shares of any industrial nation. Services, particularly banking, insurance, and business services, account by far for the largest proportion of GDP (67%) while industry continues to decline (31.5%) in importance. now employing only 18% of the work force. Britain has the eighth biggest economy in the world. Within the EU it has the fourth biggest economy, after Germany and France and just behind Italy. The UK economy is

[1] Source: Invest in Britain Bureau.

in its sixth year of sustained economic growth. Since 1992 it has grown faster than the G7 average and output is now 12% above its previous peak. In the first quarter of 1998 the UK's gross domestic product (GDP) grew by 0.5% to be 2.9% higher than a year earlier. GDP grew by 3.1% between 1996 and 1997. The International Monetary Fund (IMF) forecasts that the UK economy will grow by 2.3% in 1999 and 2.1% in 2000.

The decision to give operational independence to the Bank of England in setting interest rates, indicate the Government's commitment to low inflation.

It has a workforce of some 29 million, operating in services (69%), manufacturing & construction (17%), government (11%), energy (1%) and agriculture (1%). The UK offers an attractive tax system to companies. The main corporation tax rate is currently 30% and the rate for many small companies is lower still - just 20%. UK Corporation tax is charged on the worldwide profits of any UK resident company. Personal tax rates are nil on the first £4,335, 10% on the next £1,500, 23% on the next £26,500 and 40% on the remainder. The National Minimum Wage came into effect from April 1999. The general adult rate for the national minimum wage is £3.60 per hour. Around 17% of the population are below the poverty line.

The current exchange rate is £1.00 =C$2.2517.

1.4 Political overview

The UK is Governed by an elected parliament who sits in the House of Commons. The current Labour administration came to power with 44.5% of the vote after 18 years of Conservative Government. The UK is managed via a number of administrative regions that comprise 47 counties, 7 metropolitan counties, 26 districts, 9 regions, and 3 islands areas.

The UK Government is committed to creating open, transparent and effective markets. A key part of this is improving competitiveness in international markets. The UK has one of the worlds most open economies and relies on the ability to trade with the outside world for economic health and stability. Overseas trade is a key contributor to economic prosperity, non-inflationary growth, and the creation of new jobs and technical advancement. The UK is the world's second most successful developed country for attracting foreign direct investment (FDI) after the US itself.

The UK Government intends to build a new partnership with business to improve the competitiveness of British industry for the 21st century. It particularly welcomes foreign direct investment. New regional development agencies are proposed in England, and the development agencies in Scotland, Wales and Northern Ireland will be strengthened. The agencies will work with local authorities and the Department of Trade and Industry to encourage further inward investment.

As the twentieth century draws to a close, Britain is debating the degree of its integration with continental Europe. While a member of the EU, for the time being it is staying out of the euro system introduced in January 1999. Constitutional reform, including the House of Lords and the devolution of power to Scotland, Wales, and Northern Ireland, are key issues in Great Britain.

2 Characteristics of the housing market

2.1 Market overview

2.1.1 Number of households and dwelling types

Of the 20.4 million households in England in 1998, over 14 million own their own home (1998/9 figures), a further 4.4 million rent from councils or Registered Social Landlords and around 2 million are rented privately[2]. The table below pres ents the picture for England.

Tenure	Self contained									Bedsits	Total
	House				Flat or maisonette			Caravan mobile home/ boat	Other		
	Detached	Semi-detached	Terrace	All	Purpose-built	Conve-sion	All				
											thousands
Owned outright	1,820	1,871	1,241	4,932	251	74	325	32	7	40	5,337
Buying with a mortgage	2,261	2,955	2,748	7,965	417	239	656	0	1	69	8,691
All owners	**4,081**	**4,826**	**3,990**	**12,897**	**669**	**312**	**981**	**32**	**8**	**100**	**14,027**
Rented from:											
council	36	953	1,072	2,061	1,106	60	1,166	0	3	93	3,322
RSL	13	184	308	505	370	103	473	0	1	48	1,028
All social rented	**49**	**1,137**	**1,380**	**2,566**	**1,476**	**163**	**1,639**	**0**	**4**	**141**	**4,350**
Rented privately:											
unfurnished	161	312	426	899	188	227	415	5	7	70	1,396
furnished	50	78	173	301	105	134	239	3	0	103	647
All rented privately	**211**	**390**	**599**	**1,200**	**293**	**362**	**654**	**8**	**7**	**174**	**2,043**
All tenures	**4,341**	**6,353**	**5,969**	**16,663**	**2,438**	**837**	**3,274**	**40**	**18**	**424**	**20,420**

Table !: Type of accommodation and whether self-contained by tenure: England 1998/9 *(all households)*

The table indicates that the English market has 20,420,000 dwellings. Of these, 21% are detached houses, 31% are semi-detached, 30% are terraced, 16% are flats and maisonettes and 2% are other forms of dwelling.

The English housing stock increased by almost 50% in the 40-year period between 1950 and 1990. This provided a net growth in dwellings of some 192,000 per annum over the period. Despite this, a low level of stock replacement (~45,000 per annum over the period) has meant that the average age of the stock is still increasing. In 1971 the mean age of stock was not less than 43 years; 1991 not less than 53 years and government forecasts indicate that by 2011 the mean age of the stock will be 63 years. The last survey indicated the following age spread of the English housing stock:

[2] Survey of English Housing: Housing statistics summary number 3, 1999, DETR

Age band	Number (%) of dwelling stock
Pre-1871	1,242,700 (6.3%)
1871-1890	1,558,300 (7.9%)
1891-1918	2,406,500 (12.1%)
1919-1944	3,925,300 (19.9%)
1945-1970	6,213,400 (31.5%)
Post-1970	4,398,700 (22.3%)
Total	**19,725,000 (100%)**

Table 2: Dwelling stock by age band (1991 data)

While there are now very few (1%) homes in England that lack any of the basic amenities (a kitchen sink, a bath or shower in an inside bathroom, a wash hand basin, hot and cold water provided to each of these, and an indoor WC) there are still 1.5 million that fail the current *housing fitness standard* and 70% of these stock required repairs costing more than £100 per dwelling. These are more likely to be older dwellings. These unfit homes are found throughout the country but tend to be concentrated in older urban centres. They are mainly in private ownership, but significant problems are found on some local authority estates, usually as a result of poor design and difficulties in maintenance.

At any one time a considerable number of dwellings lie vacant. Usually defined so as to exclude second homes, holiday homes and dwellings whose owners are temporarily absent, in April 1997 there were 640,000 vacant dwellings in the private sector. At the same time, there were 81,000 vacant local authority dwellings, of which 50,000 were available for letting; 27,000 empty housing association homes; and 19,000 other public sector vacant dwellings. Not all vacant dwellings could be used. For example, about 45% of private sector empty dwellings are "frictional" or "transactional" vacancies, with properties lying empty for a short period during the selling and buying process. These vacancies are required for the effective operation of the housing market. Similar vacancies occur in social housing between lettings and are essential to allow mobility. Some empty properties are in poor condition and need renovating to make them fit for occupation. Some are in areas where people are not looking for housing. Some may be beyond economic repair, awaiting demolition. The English House condition Survey (1991) highlighted that some 1.5 million dwellings were unfit for habitation

Unit sizes

For the social housing sector, there are strict guidelines on the size and layout of dwellings. The table below illustrates these. For the private sector the issue is compliance with Building regulations rather than amenity. The private sector dwellings (like-for-like) tend therefore, to be around 510% smaller than the social stock. The main difference in the private sector is the range of dwelling sizes with a large proportion of stock being in excess of the sizes quoted below.

Dwelling type	Approximate size (in M^2)
2 bedroom – 4 person home	70-76 M^2
3 bedroom – 4 person home	74-78 M^2
3 bedroom – 5 person home	81-90 M^2
4 bedroom – 7 person home	105-120 M^2

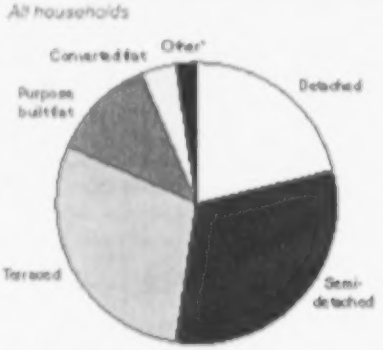
Table 3: Dwelling type typical size bands for the social sector

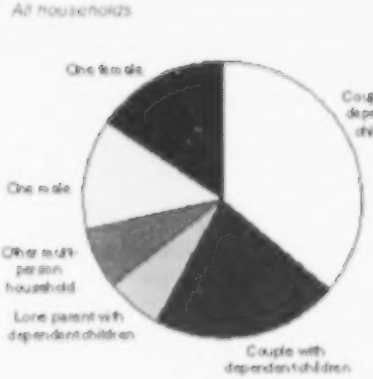
2.1.2 Household types[3]

Tenure in the UK falls into two main categories namely, owner occupied and rental property. In 1997/8 the owner occupied market accounted for almost 70% of the stock. The rental market divides into two sectors: the private market rental and rental from councils or Registered Social Landlords (RSL's). Two thirds of the rental market is from social providers and one-third are rented privately.

More than nine out of every ten owners lived in houses, while only six out of every ten council or private renters, and five out of ten RSL tenants did so. One third of council tenants lived in purpose built flats, while hardly any lived in converted flats. The proportion of RSL tenants living in purpose-built flats was marginally higher, and a further one in ten lived in converted flats.

One third of private renters lived in self-contained flats, just over half of which were conversions, and another one in ten lived in non-self contained accommodation such as *bedsits*.





The most common household type is a couple without dependent children particularly among outright owners, who were mostly relatively elderly.

One person households were the most common household type amongst renters. Two fifths of renters, in both social and private sectors, lived alone, as did one third of outright owners. Children were slightly more common in mortgaged households than in the social rented sector, but whereas the vast majority of mortgaged households with children were headed by a couple, a lone parent headed half of social sector households containing children.

Tenure	Couple, no dependant children	Couple with dependant children	Lone parent with dependant children	Other multi-person household	One person households			Total
					Male	Female	All	
								thousands
Owned outright	2,777	260	79	381	581	1,259	1,840	5,337
Buying with a mortgage	3,255	3,175	378	453	884	545	1,429	8,691
All owners	6,032	3,435	457	834	1,465	1,804	3,269	14,027
Rented from:								
Council	670	558	503	260	557	777	1,333	3,324
RSL	175	154	209	42	167	281	448	1,028
All social rented	845	712	711	301	723	1,058	1,781	4,352
All rented privately	507	272	180	316	451	318	769	2,044
All tenures	7,385	4,420	1,348	1,451	2,640	3,179	5,819	20,423

Table 4: Household type by tenure: England 1998/9(all households)

[3] Data and tables for this section are abstracts from the DETR publication *Housing in England 1997/98*.

2.1.3 Tenure patterns

The 1997/8 survey of English housing identified the following picture for heads of household in each tenure group.

Outright owners (26% of households)

- 57% were married and 28% were widowed; only 2% were cohabiting
- 94% were aged 45 or over and 59% aged 65 or over
- 65% were retired
- the average gross weekly income of the head of household (and partner) was £306 a week

Mortgagors (43% of households)

- 76% were married or cohabiti ng
- 96% were under 65
- 85% were working full time
- the average gross income of the head of household (and partner) was relatively high, £547 a week

Social rented sector tenants (21% of households)

- 38% were married or cohabiting and a further 42% were previously married
- 44% were female (compared with 25% for all households)
- 15% were lone parents
- 36% were aged 65 or over
- only 23% were working full time, and 62% of households contained no earner
- the average gross income of the head of household (and partner) was £155 a week, the lowest of all the tenure groups

Private rented sector tenants (10% of households)

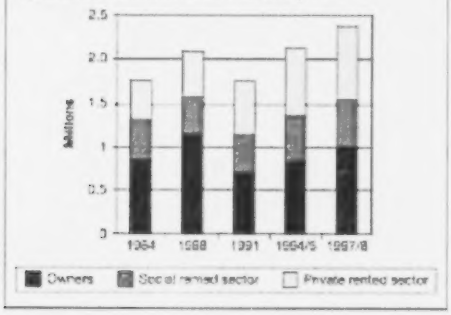
- 40% were married or cohabiting and 35% were single
- 69% were aged under 45
- 71% were male
- 54% were working full time
- the average gross income of the head of household (and partner) was £305 a week

Mobility

The 1997/8 SEH estimates that 2.4 million households (12% of all households) moved in 1996. The mobility of owner-occupiers is linked to the housing market. During the 1990s, the number of owners moving increased steadily to one million in 1997/8. The percentage of

social sector tenants moving each year has increased gradually from 9% in 1988 to 12% in 1997/8.

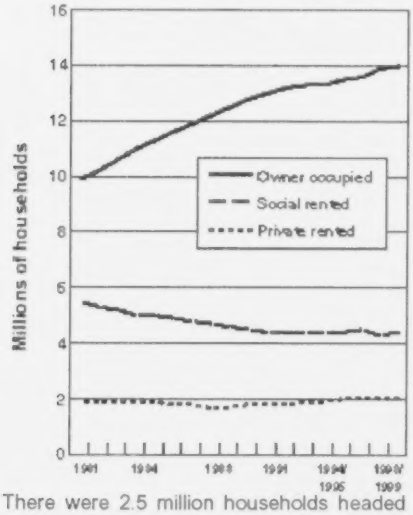
Chart 1 Current tenure of recently moving households



Trends in tenure

The proportion of households which were owner occupied increased fairly rapidly during the 1980s, from 57% in 1981 to 68% in 1991, but has changed relatively little during the 1990s, the proportion in 1998/9 being 69%.

The number of council tenancies continues to fall (16% of all households in 1998/9), but in recent years this has been largely balanced by the growth of Registered Social Landlords (mostly housing associations), in many cases by the direct transfer of council dwellings to RSLs.



After reaching a minimum in 1989, the private rented sector grew modestly for several years to about 2 million households, 10% of the total. The percentage of private renters moving each year rose from 24% in 1984 (450 thousand households) to 42% in 1997/8 (830 thousand households). This increase is largely attributable to the increasing youth of the sector.

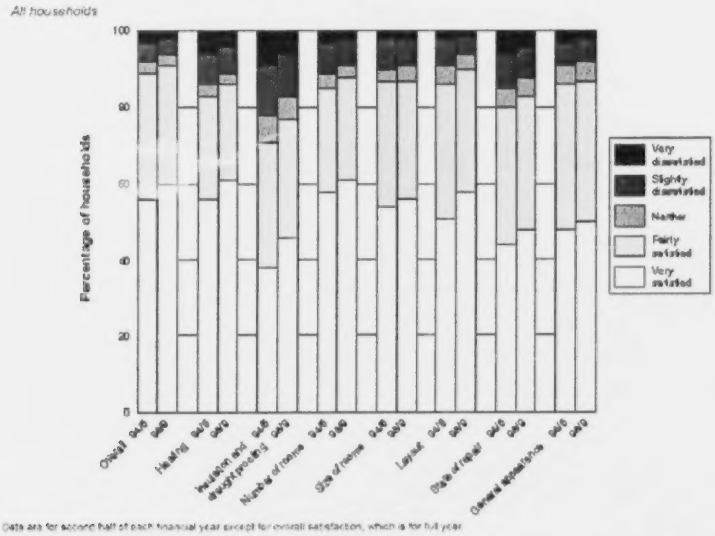
Most moves were fairly local - three fifths of all moves in the last three years were of less than 5 miles; only 11% were of 50 miles or more and 3% from Northern Ireland or abroad. Social renters were the most likely to have moved within the local area - one third had moved less than a mile. Private renting was involved in half of all moves, either as an origin or destination, or both.

There were 2.5 million households headed by someone over 75 in 1998/9, compared with 1.6 million in 1977/8.

In 1997/8 a large majority of private sector tenants aged 20-34 expected to buy their own home eventually (82% of couple households and 75% of one person households). These figures are slightly lower than in 1994/5 but snow that an aspiration to owner-occupation is still widespread among younger households.

2.1.4 Consumer requirements

In 1998/9 the Housing in England Survey asked how satisfied or dissatisfied people were with various aspects of their accommodation. 60% of householders said they were very satisfied with their accommodation and 31% said they were fairly satisfied. Only 2% said they were very dissatisfied and 4% that they were fairly dissatisfied.



Data are for second half of each financial year except for overall satisfaction, which is for full year

In terms of complaints, the largest single response item relates to noise pollution. Over 40% of the UK stock involve terraced and flatted developments. This is thought to be responsible for the poor showing of *insulation* in the above table, as it does not correlate with the *heating* response.

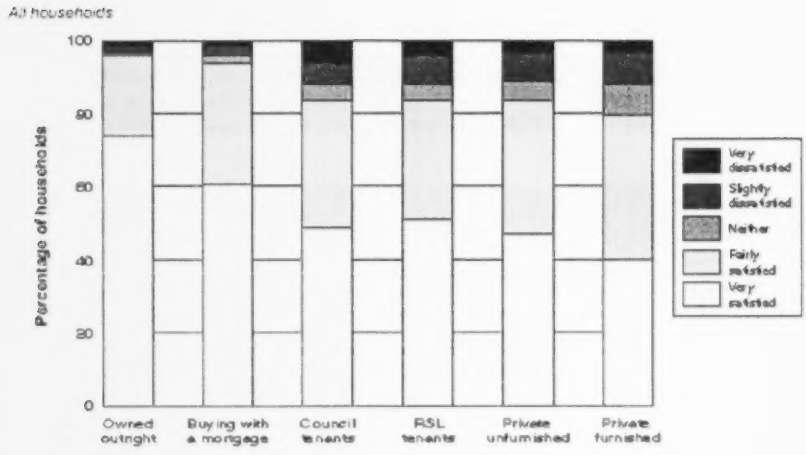
Feedback from private research findings of two major national developers suggests the following items are the issues that greatly influence consumer-purchasing decisions.

- **Overall elevation and street scenes ('kerb-appeal')**
- **Hallways and landings as a feature**
- **Family room**
- **En-suite to main bedroom**
- **Focal point in living room (e.g., fireplace)**
- **Kitchen layout with facility to eat in kitchen**
- **Storage space**
- **Showers**
- **Utility room/area**

For the social sector, the needs of the consumer tend largely to coincide with those of the RSL client, i.e.,

- **Low-maintenance costs**
- **Low-running costs (primarily fuel and water bills)**
- **Secure environment**
- **High acoustic insulation (often specify 10%+ above Building Regulations)**
- **Storage**
- **Wet-radiator system ('aspirational' product)**

Overall, the current UK satisfaction levels with the existing stock (by tenure) are shown below.


All households
Percentage of households
100
80
60
40
20
0
Owned outright
Buying with a mortgage
Council tenants
RSL tenants
Private unfurnished
Private furnished
Very dissatisfied
Slightly dissatisfied
Neither
Fairly satisfied
Very satisfied

2.2 New build housing

2.2.1 Demand

In 1999, 176,400 new built units were construction in the Great Britain[4] (around 1000 units less than in 1998) with a further 10,600 constructed in Northern Ireland. These comprised;

166,000 No.	Private enterprise
20,800 No.	Registered Social Landlords
200 No.	For Local Authority and Government departments.

Geographically, the spread of this construction is illustrated below:

Contrary to popular belief, production over the course of a year is fairly static at between 14,700 and 15,500 starts per month. The only exceptions to this are a dramatic increase in starts for the month of March (to around 20,000 units) and a decrease during December (to around 9,000 units).

Again year on year, there is little regional variation in demand with two exceptions: production in Wales increased by 7% in 1999 (over the previous 12 months) and production in Northern Ireland increased by 17%.

Daily sales figure for 1999 average around 480 units during the first quarter of the year and are fairly static at around 550 units for the rest of the year. The busiest sales periods are May (618 per day during 1999) and November (601 sales).

Retirement Homes

In addition to the above, a further 1256 units of warden assisted retirement homes and 409 non-warden assisted were constructed. In total this market contracted by some 870 units or 35% on the previous 12 months.

A further 1103 homes were constructed for chronically sick and disabled in 1999. By contrast, this figure increased almost 60% on the previous year. Figures for the first quarter 2000 show an additional 50% increase on the same quarter 1999. The trend is too short to be significant, but, as with other developed countries with ageing populations, it is a market to watch for the future.

Dwelling Types

There are six categories of dwelling type used in the UK to categorise new construction, namely; detached houses, detached bungalows, semi-detached houses, terraced houses, attached bungalows and flats and maisonettes. The table below illustrates the demand and market share of each type of dwelling across the UK regions.

[4] Source: DETR Housebuilding starts, January 2000.

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[4] Source: DETR Housebuilding starts, January 2000.

	Total number of units	Detached houses	Detached bungalows	Semi-detached houses	Terraced houses	Attached bungalows	Flats and maisonettes
England	146,100	45%	3%	18%	17%	2%	17%
Wales	9,300	60%	4%	18%	11%	1%	5%
Scotland	21,000	36%	7%	17%	9%	2%	28%
Great Britain	176,400	44%	4%	17%	16%	2%	17%
Northern Ireland	10,600	32%	15%	25%	7%	5%	15%
Total constructed units	**187,000**	**81,000**	**8,600**	**32,600**	**29,000**	**4,000**	**31,800**

Table 5: UK Market share by dwelling type

	Total number of units	Detached houses	Detached bungalows	Semi-detached houses	Terraced houses	Attached bungalows	Flats and maisonettes
North East	7,100	55%	2%	22%	7%	3%	11%
North West	14,800	51%	2%	19%	14%	1%	12%
Merseyside	3,100	38%	1%	27%	14%	3%	18%
Yorkshire & Humberside	15,400	53%	3%	20%	11%	2%	10%
West Midlands	15,100	50%	3%	21%	15%	2%	9%
East Midlands	15,600	60%	6%	17%	12%	2%	3%
Eastern	19,300	45%	5%	17%	20%	1%	12%
South West	14,800	49%	5%	19%	17%	1%	10%
Greater London	**15,600**	**6%**	**0%**	**9%**	**25%**	**1%**	**59%**
South East	25,100	42%	2%	15%	20%	1%	19%
Total England	146,100	45%	3%	18%	17%	2%	17%

Table 6: Dwelling type demand throughout England

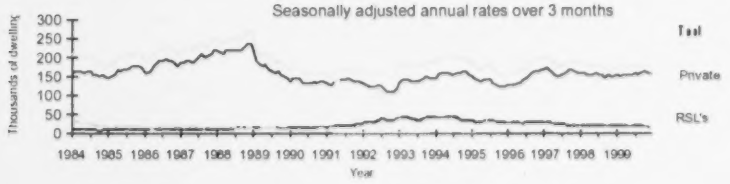
Detached housing still forms the major share of the market in all areas (except London). The spread amongst terraced, semi's and flats is fairly even with each making up just under a 1/5th of the all properties constructed.

2.2.2 Forecasts and trends

During the 1960's the UK house building market was booming with on average 350,000 new start every year. This peaked in 1968 with 460,000 starts. Since this time, however, the market has experienced significant decline. During the 1970's the average construction rate was 300,000 homes per annum and during the 1980's this fell still further to 202,000 per annum. The 1990's have seen a continuance of this trend with around 185,000 starts per annum.

The key factor underlying this trend is the virtual elimination of council house construction that has fallen from 150,000-200,000 per annum in the 1960's to a few thousand in the 1990's. The growth of the Housing Association market has gone some way to fill this void but production here is far short of the hayday of public sector involvement in the housing market. The table below illustrates the current position with regard to private and public housing provision.

HOUSEBUILDING STARTS: GREAT BRITAIN



In 1996, the Government announced a forecast requirement for 4.4 million homes by 2016, suggesting a build programme of ~220,000 units per annum. This volume has of production has consistently not been met.

Trends by market type (1995-2005)

The social housing market has contracted consistently since it's hayday of the 1960's and the trend is continuing. Even since 1995, production has been cut by 1/3rd to just 20,800 units in 1999. The treasury budget allocations for the next three years indicate this level of production will continue with forecast of between 17,500 and 22,000 units per annum being used by the Housing Corporation.

The vast Local Authority development programmes of the 1960's and 1970's are over with responsibility for new provision passing to the Housing Associations. Even in the last 5-years, the Local Authority market has contracted by over 80% to just a few hundred units in 1999. Similarly, many Large Scale Voluntary Transfers (LSVT's) are planned, moving responsibility for *existing* local authority stock to the Housing Association providers. Up to 300,000 units of the existing stock are planned to be managed under such transfer arrangements per annum. This trend towards the housing associations as providers is unlikely to change significantly although changes to the funding mechanism for social housing will mean local authorities theoretically will have a greater say in new house production.

Currently the Housing Corporation's annual housing grant is allocated largely direct to housing associations as the housing providers. Over the next 5 years, the Governm ent is committed to allocate more of the funds directly to Local Authorities who then work in partnership with HA's and developers/contractors to deliver the stock.

Speculative housing has remained consistent in the period to date, producing some 160,000 homes per annum. If Government forecasts were to be met, this would suggest significant growth is required in the market, yet most developers feel any growth is likely to come from higher quality/cost products, rather than volume.

The number of registered builders has fallen consistently since 1990, from a high of 29,000 firms to 1999 figures of 16,207. The majority of this attrition is within the small builder segment (0-10 units per annum) but the fall is consistent across all the size sectors (with the exception of the large builder category (2000+ units) which have grown slightly in number.

The self-build market has grown steadily to around 10% of the private market (17,500 units in 1999). The five-year trend would suggest growth in this market is likely but, land access and the complex planning process will ensure any growth is slow to influence the self builders market share.

Trend by region (1995-2005)

The Welsh market has remained constant at around 10,000 units per annum and this is likely to continue. A slight increase (5%) in detached houses has been reported in the last five years.

The Scottish market has contracted consistently since 1995 from a high of 25,000 units to a low point in 1998 of 19,800 units. 1999 has seen some recovery here (21,000 units) but in general, the year-on-year decline is likely to continue. The spread of dwelling type has remained largely unchanged with the only significant reportable feature being 1/3rd of the market is in flats.

By contrast, the **Northern Ireland market** has grown consistently over the last 10 years from a low point of 7,400 units to 10,600 units in 1999. Bungalows have always held a strong market share of almost 1/3 of the production but this has fallen in recent years to 1/5th. First quarter 2000 figures suggest this is continuing (18%). The fall in this market is replaced by expansion in flatted development. Flats have doubled their share to 15% over the period. Fist quarter 2000 figures suggest this is continuing apace, with 20% of all starts reported as flats.

Whilst the NI market represents only ~5% of the total production, this market is widely tipped to continue it's growth pattern with flats increasing their share of the market. (Note: Up until recently, NI Building Regulations excluded buildings over 3 stories – this has now been lifted and is clearly a contributor to the market expansion.

The English market has remained reasonably stable over the period with around 146,000 starts per annum. Overall the growth market is flats with a 13% increase in volume in the period 1998-1999. Planning regulation, the Governments promotion of use of Brownfield land and regeneration schemes are all playing their part in seeing a rapid expansion of multi-story development. In unit terms, 4,000 more flats were constructed last year, with major conurbations (e.g. Merseyside and the South West– 30%) showing the largest increases.

The second change area is in relation to the low-volume/high-quality-price type development. Dwellings in the dearest category £250,000+ have seen the most growth in 1999, doubling their share in the last 2 years. To some extent, this could be seen merely as a result of inflation, pushing more units into this bracket. However, clear messages sent by a number of major developers to shift towards lower volume/higher margin product (e.g., Laing Homes) suggest this trend may continue.

2.2.3 Profile of UK housing sectors

Social housing

The Housing Corporation was established by Parliament in 1964 to promote voluntary non-profit making housing associations and co-operatives. The Corporation is a non-Departmental public body sponsored by the DETR. The Corporation regulates and funds registered social landlords (RSL's) in England (similar organisations exist in Scotland, Wales and Northern Ireland). Since 1974 the Housing Corporation has been the major provider of capital finance for RSLs, using the Approved Development Programme (ADP) which is the chief mechanism for this funding. The Housing Corporation's mission statement is "to work to improve people's quality of life through social housing". This is underpinned by five strategic aims:

- To help revitalise and maintain sustainable housing and neighbourhoods;
- Act in the interests of tenants and residents;
- Secure the effective stewardship of existing stock;
- Safeguard the public interest and;
- Encourage innovation and the pursuit of Best Value.

The Corporation is responsible for the planning, management and delivery of the ADP the which make up the majority of their spending programme.

Year	Budget	ADP Allocation
2000/1	£762 million	£642 million
2001/2	£691 million	£658 million
2002/3	£659 million	£659 million

Table 7: Annual Social housing funding in England & Wales

This funding is typically matched (50%) by RSL's (who use private funding) to create a £1.5 billion social housing programme per annum. Of the £642 million allocated this year, roughly 90% is used for housing for rent and 10% for home ownership initiatives. 70% of the budget is targeted at regeneration activities (work to existing stock, rehabilitation and new-build on brownfied sites). 750 homes are earmarked for investment in rural communities.

The investment is allocated largely on an annual competition basis (usually September/October for start April the following year). 484 RSL's received allocation in 2000/1, 310 of which, will use the allocation for new-build. £120 million of this years funding covering 243 projects has been allocated in accordance with the Egan Principles laid down in Rethinking Construction[5]. See government initiatives 2.4.4 for details.

[5] Rethinking Construction, DETR August 1998.

The grant is spread[6] across the regions as below:

Region	Allocation in £ (millions)	% of total	Approximate number of units	Average weekly rent
London	£277	43%	8,500	£77.53
South East	£70	11%	2,200	£67.25
South west	£43	7%	1,400	£62.92
East Midlands	£29	5%	1,000	£56.29
Eastern	£40	6%	1,300	£62.70
West Midlands	£48	7%	1,500	£59.71
Yorkshire & Humberside	£41	6%	1,300	£60.41
North East	£18	3%	700	£53.10
North West	£53	8%	1,800	£62.26
Merseyside	£23	4%	900	£57.77
TOTAL	£642	100%	20,600	£65.92

Table 8: Spread of ADP allocation across the English market

The relationship between social and private housing provision across the UK is around 1:8 yet in London the relationship is 1:1. The allocation clearly demonstrates the need for affordable homes in London and the South East, which receive some 54% of the total grant allocation.

Registered Social Landlords (RSL's) are independent, not for profit private sector organisations. Since the late 1980s almost all new social housing has been provided by RSL's. In addition local authorities were given the option of transferring their stock to RSL's. One of the main reasons for this is that RSL's, being in the private sector, can raise private finance for new schemes and for investing in stock transferred from local authorities outside the constraints of Public Expenditure control and the Public Sector Borrowing Requirement. There are over 2,500 RSL's that together own about 1 million homes. The largest 200 RSL's own 90% of the stock. 5% of all housing stock is owned by RSL's and they have to date raised around £12 billion in private finance to improve and develop the UK's social housing stock. The leading HA's with new building development programmes and an estimation of their pipeline of production is defined below.

Ranking	Housing Association	1998 figures
1	North British	3,872
2	Southern Housing Group	2,941
3	Home Housing Group	2,671
4	Sanctuary Housing	2,552
5	London & Quadrant	2,474
6	Hyde Housing Group	2,164
7	Bromford Carinthia	1,936
8	Northern Counties	1,522
9	Sovereign	1,500
10	Ealing Family Housing	1,498
11	Orbit	1,448
12	Waterloo	1,372
13	Raglan	1,252
14	Knightstone	1,202
15	Moat Housing	1,181
16	Downland	1,113
17	Circle 33	1,106
18	Liver Housing Association	1,071
19	Paddington Churches	1,063
20	South London Family Housing	1,041
	TOTAL PRODUCTION	34,979

Table 9: Leading HA's and their production pipelines for new-build homes

RSLs submit bids for the Social Housing Grant to the Housing Corporation Regional Offices in a competitive bidding round. The Corporation approves schemes that meet local housing needs at affordable rents and that offer good value for money in terms of the public subsidy required and the quality of homes delivered. An abstract from the Housing Corporation's

[6] This 'spread' is determined by a *housing need index* calculated by the housing corporation.

Investment Bulletin (March 2000) is attached at annex 1. This highlights all the RSL's that have received more than £1 million in ADP in the last bid round.

The stock is then constructed, typically under a Design & Build contract, by either the specialist partnership homes divisions of major developers (discussed under private enterprise) or by specialist contracting companies.

The specialist contracting companies are estimated to produce around 40% of the social housing stock. Many of these are small-scale local operations. This suits the social sector as it allows them to contribute to creating local employment and training opportunities through their development programmes that could benefit their tenants. For the larger HA, general contractors are often used. A number of these have developed specialist social housing firms that still tend to have a strong regional bias. The key firms in the Southern market are:

	Contractor
1	Willmott Dixon Housing
2	Laing Partnership
3	Lovell Partnerships
4	Alfred McAlpine Partnership
5	MJ Gleeson Group
6	Mount Anvil
7	Rydon Construction
8	Llewellyn Construction
9	Osborne Construction

Table 10: UK leading Contractors

Private enterprise is responsible for around 87% of the total housing starts in the UK. Of the 16,207 registered builders in the UK, 5,600 were active in house construction in 1999. The number of firms active and their output is presented below.

Annual production rate	Number of firms
1-10 dwellings	4633
11-30 dwellings	598
31-100 dwellings	245
101-5---dwellings	101
500-2000 dwellings	21
2000+ dwellings	14

Table 11: Number of builders and their annual production rate (1999 figures)

In 1999, the top 25 builders were responsible for the production of 58% of the UK's new housing stock. Key firms in the market and their approximate annual production are:

Ranking	Housebuilder	1998 figures
1	Wimpey Homes	12,700
2	Barratt Homes	8,650
3	Beazer Homes	8,100
4	Persimmon Homes	7,100
5	Bellway Homes	5,275
6	Wilson Connolly	4,900
7	Bryant Homes	4,375
8	Westbury Homes	4,175
9	Wilson Bowden	3,425
10	Berkeley Homes	3,400
11	Redrow Homes	3,050
12	Bovis Homes	2,750
13	Fairview Homes	2,300
14	Crest Nicholson	2,200
15	Countryside Properties	1,950
16	Fairclough Homes	1,900
17	Laing Homes	1,900
18	Mc Alpine Homes	1,860
19	Prowtings	1,825
20	Tay Homes	1,650
	TOTAL PRODUCTION	83,475

Table 12: Top 20 UK Developers

A profile of a typical UK developer is presented here.

- National profile, delivering stock through a series of 6-10 regional offices.
- Have a strong regional bias (e.g. Countryside – Essex & Kent, Westbury – South West, Beazer – North West).
- Generally hold a 3-year land bank.
- Typical schemes would be 30-300 units with much larger schemes being shared between consortia of developers[7].
- Brand products according to price bands - e.g., Beazer Partnership Homes (social housing), Beazer Homes (general development stock) and Charles Church (executive homes over ~£250,000).
- Use a standard family of house types with elevational treatments to suit local planning requirements.
- Have specialist division to work as contractors for the social housing sector.
- Sub-contact all site works (other than site management).
- Have national supply chain agreements for materials (usually reviewed annually).
- Use a combination of show-homes and on-site sales units to market homes.
- Build to sales (i.e., release plots in small batches for sale and then construct that batch. This also allows them to maximise return by testing price sensitivity of units).
- Show 8%+ net margins.

Self builders are a growing sector of the private enterprise market. A recent study[8] identified that around 10% of UK housing starts (17,500 in 1999) are self-build. Approximately 2,000 are in Scotland, 3,000 in Northern Ireland and 12,500 in England and Wales. Although detailed numbers are not available, the market has grown steadily over the last 10 years and has seen a dramatic growth in the number of self-build type consumer magazines. Around 80% of the properties are detached houses with a further 16% being detached bungalows. Around 95% of these are built using masonry construction with the remainder being timber frame, often bought in packages from specialist firms.

A typical self-builder is in their 30's (50%) or older (40%), married (74%), professional (46%) and have an average annual income £36,239. 88% have previously owned their own home.

Links between the sectors

Whilst the social & private housing market are presented separately, in reality, the relationship is much more symbiotic. As mentioned, most of the national developers operate social housing divisions which work in partnership with the RSL's to provide their stock. This has largely been the result of current planning guidance (section 1.06). This allows planners to make the provision of a proportion of social housing on speculative schemes (over 25 units in size) part of the planning conditions. It has therefore, become necessary for the two markets to collaborate to undertake successful mixed tenure developments.

Further, HA's unlike their predecessor of LA's, do not hold land banks. This means that in reality, the social housing sector is largely reliant on developers to provide development

[7] This prevents them competing with their own units being sold on via private resale.
[8] Funded by the Joseph Rowntree Foundation (1999).

opportunities. It is estimated that around 80% of social housing land provision are sourced this way[9]. Similarly, it is estimated that around 60-65% of the new-build stock is actually constructed by developers.

This is the key reasoning behind the Government's initiative to focus on using the social housing market to innovate and lead change, acting as a catalyst for the private sector.

2.2.4 Prices

Sales values

The table below provides an indication of price trends in the UK market over the past two years.[10]

Table 13: House prices in the UK 1999-2000

Using broad bands as indicated below the % of UK housing stock falling into each price category can be seen below:

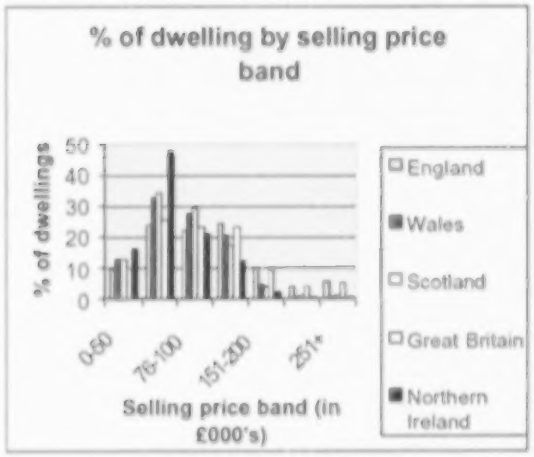


Table 14: Dwellings by price band.

[9] A small number of schemes are identified by consultant contacts like architects and engineers.
[10] Source: NHBC New House-Building Statistics 2000 (Quarter 1).

Prices across the UK vary considerably with price fluctuations of around 50% being commonplace . Average prices by house type are identified below [11]

	Total number of units	Detached houses	Detached bungalows	Semi-detached houses	Terraces houses	Attached bungalows	Flats and maisonettes
England	146,100	£144,000	£107,000	£74,000	£95,000	£63,000	£109,000
Wales	9,300	£104,000	£87,000	£58,000	£64,000	£55,000	£67,000
Scotland	21,000	£117,000	£93,000	£64,000	£58,000	£59,000	£78,000
Great Britain	176,400	£139,000	£103,000	£72,000	£91,000	£62,000	£102,000
Northern Ireland	10,600	£92,000	£70,000	£59,000	£74,000	£59,000	£95,000

Table 15: Average house prices by house type across the UK

Within England, the price trends are more dramatic. The table below clarifies the regional cost focus and illustrates the strength of demand in London and the South East. Prices in the South East (approximately 17% of the English market) are almost 100% dearer than the cheapest region (East Midlands). The London market where demand for all types of property is strong, can command average premiums of up to 2-3 times the costs in the regions.

	Total number of units	Detached houses	Detached bungalows	Semi-detached houses	Terraces houses	Attached bungalows	Flats and maisonettes
North East	7,100	£99,000	£90,000	55,000	£55,000	£42,000	£71,000
North West	14,800	£120,000	£102,000	£59,000	£66,000	£71,000	£69,000
Merseyside	3,100	£103,000	£106,000	£56,000	£53,000	£71,000	£77,000
Yorkshire & Humberside	15,400	£106,000	£90,000	£56,000	£65,000	£50,000	£62,000
West Midlands	15,100	£138,000	£110,000	£62,000	£69,000	£50,000	£62,000
East Midlands	15,600	£117,000	£87,000	£55,000	£57,000	£46,000	£53,000
Eastern	19,300	£163,000	£105,000	£92,000	£93,000	£59,000	£89,000
South West	14,800	£137,000	£115,000	£75,000	£79,000	£71,000	£93,000
Greater London	15,600	£284,000	£146,000	£124,000	£155,000	£156,000	£148,000
South East	25,100	£218,000	£156,000	£102,000	£113,000	£94,000	£102,000
Total England	146,100	£144,000	£107,000	£74,000	£95,000	£63,000	£109,000

Table 16: Average house prices by house type across England

According to the NHBC, *"The median selling price of new homes sold in Great Britain in the first quarter (2000) was 16% higher than a year previous... with especially high increases in London, South-West and the West Midlands".* There are however, signs that the market is cooling. Mortgage applications are down by almost 10% in April 2000 on the previous month, with the drop in first time buyers being the most significant. House starts have also dropped by 6% in the first quarter 2000 (compared to 1999 figures).

Construction costs

A recent study[12] commissioned by the Department of Transport & Regions (DETR) identified the current construction costs for the social housing sector. Over 2000 units constructed on 81 sites by 20 Housing Associations across the UK were benchmarked. The results were as follows:

Accuracy of costing

77 of the 81 respondents provided details of the costs of their construction projects. This was provided in terms of original contract value compared to project outturn costs. The results were;

Forecasting accuracy	No. schemes	%
Completed on budget	26 schemes	34%
Completed within budget	12 schemes	16%
Completed outside budget	39 schemes	50%

Table 16: Predictability of scheme completion.

[11] NHBC figures first quarter 2000.

[12] Palmer S. *Benchmarks for UK social housing.* November 1999.

Of those completed within budget;

Forecasting accuracy	No. schemes	%
Within .05% of budget	9	12%
Within 0.5% - 1% of budget	1	1.33%
Within 1-2% of budget	1	1.33%
Over 2% of budget	1	1.33%
Total	12	16%

Table 17: Savings on projects completed within budget.

Of those completed outside budget;

Forecasting accuracy	No. schemes	%
Within 0.5% of budget	13	17%
Within 0.5%-1% of budget	12	15%
Within 1-2% of budget	6	8%
Within 2-5% of budget	5	6%
Over 5% of budget	3	4%
Total	39	50%

Table 18: Average overspend on projects over budget.

The average scheme outturn cost was only +0.64% higher than the contract costs taken across all the schemes.

Building costs

All 81 survey respondents provided details of the overall scheme costs and 77 sites provided a breakdown into the 5 categories listed below;

1. Substructures
2. Superstructures
3. Finishes
4. External works
5. On-costs

The sample projects (with costs uplifted to 4th quarter 1998) total some £96.7 million in value and represented the construction of some 127,000 square metres of development. The findings are expressed in the following 4 tables;

	Substructure (£ per M²)	Superstructures (£ per M²)	Finishes (£ per M²)	Externals (£ per M²)	On-costs (£ per M²)	Totals (£ per M²)
All schemes[13]	*£89.00*	*£286.00*	*£115.00*	*£147.00*	*£122.00*	*£759.00*
Bungalows	£90.00	£323.00	£75.00	£251.00	£130.00	£869.00
Houses	£77.00	£277.00	£92.00	£128.00	£117.00	£691.00
Flats	£91.00	£350.00	£127.00	£97.00	£118.00	£783.00
Mixed	£66.00	£260.00	£120.00	£131.00	£119.00	£696.00[14]

Table 19: Cost results – averages by site type

	Best practice	Poorest practice	Average
All schemes	*£507.00*	*£1,225.00*	*£759.00*
Bungalows	£824.00	£874.00	£869.00
Houses	£507.00	£1,091.00	£691.00
Flats	£654.00	£1,091.00	£783.00
Mixed	£546.00	£1,225.00	£696.00

Table 20. Cost results - spread by site type

[13] Costs uprated to 4th quarter 1998 using DETR indices.

[14] Mixed development schemes were, on average twice as large as the other scheme types.

	Substructure (£ per M^2)	Superstructures (£ per M^2)	Finishes (£ per M^2)	Externals (£ per M^2)	On-costs (£ per M^2)	Totals (£ per M^2)
All schemes	*£89.00*	*£286.00*	*£115.00*	*£147.00*	*£122.00*	*£759.00*
1-9 units	£69.00	£311.00	£121.00	£137.00	£163.00	£801.00
10-19 units	£85.00	£329.00	£109.00	£147.00	£116.00	£786.00
20-39 units	£84.00	£262.00	£110.00	£106.00	£104.00	£666.00
40-59 units	£98.00	£246.00	£146.00	£176.00	£111.00	£777.00
60+ units	£102.00	£294.00	£81.00	£165.00	£143.00	£785.00

Table 21: Cost results – effect of site size (all schemes)

		Number of sites	Best practice	Poorest practice	Average
1	Scotland	0	0	0	0
2	North	3	£648.00	£874.00	£781.00
3	Wales	0	0	0	0
4	Midlands	5	£519.00	£828.00	£646.00
5	East	8	£507.00	£677.00	£628.00
6	South West	12	£604.00	£916.00	£771.00
7	South East	21	£654.00	£1,091.00	£774.00
8	London	32	£530.00	£1,225.00	£833.00
	Total	81	£507.00	£1,225.00	£759.00

Table 22: Cost results – effect of location

The tables above present an interesting snapshot of construction costs. External works account for almost 20% of all construction cost and on the larger schemes represent an even greater proportion of the development costs. Similarly, the preliminaries or on-costs represent on average 16% of all costs. Finally, a snapshot of a typical house superstructure costs are presented here.

Work element	Cost per M^2	% of total
Superstructure		
External walls, windows & doors	£133.00	46.5%
Upper floors	£17.00	6%
Roof	£45.00	16%
Stairs	£6.00	2%
Internal walls and partitions	£10.00	3.5%
Internal doors	£3.00	1%
Disposal installations	£17.00	6%
Services	£10.00	3.5%
Space heating/ventilation	£25.00	8.5%
Electrical installations	£20.00	7%
Grand Total	£286.00	100%

Table 23: Typical breakdown of house superstructure costs

2.2.5 Land supply

There are substantial public and private landowners, the former including major owners of land and property such as the Ministry of Defence and the National Health Service, and the latter including agricultural landowners and residential developers. Whether or not a residential development can proceed is subject to a specific local authority planning approval. This in turn, is influenced by a backdrop of Local council land allocation development plans through Strategic Planning and Local Plan reviews, and is adjudicated by elected local authority members and ultimately via an appeals process to the Secretary of State.

Whilst there are highly viable development locations nation-wide, it is generally the case that housing land supply is most limited in Southern England, particularly in the South-East, which is also the area of the highest value housing and the area of greatest need/demand for new housing. Consequently, consented residential land commands exceptionally high values in the South and is treated as a major asset and traded as a valuable "raw material" for housing development.

In Northern England, Wales and Northern Ireland, residential markets are more fragmented and land supply is less limited in terms of availability and attracts a lower premium per consent. Scotland enjoys its own premier market in the cities of Edinburgh and the more attractive parts of Glasgow.

In all parts of the country, residential developers are eager to maintain *development landbanks*, with a typical objective to hold a minimum three year land supply against current year turnover (thus, a residential developer turning over 7,000 homes per annum would aspire to a minimum *consented* landbank of 21,000 plots.) It is, of course, correspondingly harder for developers active in the most lucrative Southern markets to achieve this objective and many developers supplement their consented landbank with *strategic land* acquisitions. This strategic land will combine a mix of both *brownfield* land (i.e. seeking to replace an existing use with residential development, such as a redundant factory, school or hospital site) and *greenfield* land (previously un-utilised, recreational or agricultural). This land would be view for medium to long term development, with a 5-10 year lead-in to planning being most common. As a general rule of thumb, A major housebuilder would seek a balanced portfolio where 50% of their programme is from their development landbank and 50% from their strategic landbank.

Strategic acquisitions are often acquired by the major housebuilders through Option Agreements. Options can extend over a large area and provide for an initially modest contribution to the landowner followed by major price uplift once residential planning consent is obtained. The developer holding the option deals with the promotion of the site through local plan reviews, submits for and obtains planning consent, and generally takes the "hard work" out of the development process, in order to have the sole rights of site acquisition, often at a discount to 100% market value. Other major strategic sites are progressed by firms of Estate Agents on behalf of both private and public landowners, but with a particular concentration on public development sources in recent years as government institutional landholdings have been rationalised.

Location, location, location

This complex market is also heavily driven by *Location*. Housebuilders prefer to acquire a sufficient volume of land within any one site acquisition on which to sustain compounds and offices for both on-site assembly and sales & marketing purposes. Developments of 50 – 300 dwellings in one location are not unusual, with the largest developments comprising over 2,000 dwellings, usually partitioned on a consortium basis between different developers. Ignoring the highly specialist Central London market, residential land values in London and the South-East currently range from £800,000 to £2,000,000 per developable acre, depending upon achievable density and development mix. This mix will typically be in the order of 12500-15000 square feet per acre. In other parts of the UK, residential land values are significantly lower, with development in some deprived areas earmarked for regeneration actually receiving government grant subsidy to enable viable open market development (with the intention of stimulating local economies and achieving a more mixed tenure housing stock.)

In recent years, both Labour and Conservative Governments have endeavoured to promote the provision of affordable housing for lower income groups on new developments, particularly in the high-demand South where housing affordability and availability are major issues. Planning guidelines now enable local authorities to negotiate for a proportion of any substantial development (over 25 dwellings in most areas) to comprise a proportion of social or "low cost" housing. Many residential developers now employ their own specialist advisers in this area and are increasingly experienced in delivering multiple tenure development solutions, including meeting the specifications and standards required by registered social landlords who own and manage this stock.

Urban regeneration

Urban development by municipal authorities in the 1960's and 1970's was characterised by concrete/mass housing experiments which are generally held to have been a failure, with this stock now comprising the least desirable residences in the UK. With funding levels reduced in the 1980's and 1990's, this stock requires urgent replacement, and provides a suitable vehicle for demolition and redevelopment in urban conurbations. In the public sector a number of Housing Action trusts (HAT's) have been established, typically to manage the redevelopment

of rundown council estates. A HAT might have a 5-year lifespan and redevelop between 1000 and 2000 dwellings in close consultation with the existing tenants. However, there are complications to address, not least the stigmatisation of these locations, the views of existing residents and the expense of demolition and redevelopment.

Urban regeneration is, therefore, not a panacea to land availability shortfalls, and successive governments have generally failed to achieve their brownfield development targets. Interestingly, however, the Conservative government's 50% target has recently been increased by Labour to 60%, with a corresponding encouragement within planning guidelines for relaxation of density restrictions and car parking provision in central urban developments, particularly those served by public transport nodes. This is expected to impact significantly on the nature and type of brownfield development, with a renewed emphasis on *high density apartment block schemes*. The "quality market" will, however, remain rooted in large family dwellings developed on two stories at development densities of 5 – 10 dwellings per acre, with 3 storey "town houses" coming back into favour in some urban locations.

Finally, it is fair to comment that the housing industry in the UK is more *land* than *product* led, although there are signs of a sea-change in customers' attitude to quality and reliability. Consequently, there is a definite movement for innovation and change in all areas of the housing process that, if successful, will transform the industry over the forthcoming years.

2.3 Housing technology

2.3.1 System types and market share

The failure of 1960's concrete multi-storey housing systems and perceived quality control problems with on-site assembled timber frame housing in the 1970's and early 1980's, had, until recently, left the UK market starved of new technology and manufacturing solutions. For example, three years ago the UK market for timber frame represented just 6% of the total new-build housing stock. This is particularly the case in England (2% market share), with industry leaders and commentators remaining suspicious of new systems. However, the decline in traditional craft skills, the change in demographics involving a reduction in available employees and the stigma of poor safety standards and working conditions associated with building sites, has forced both government and the housebuilding industries to become more open minded towards new ways of providing housing stock. . **Consequently, there is currently a major, sustained shift in favour of frame manufacture and technological innovation.**

For classification purposes, there are three basic construction forms represented in the UK housing market, i.e., Masonry construction, Timber frame construction and others.

Masonry construction

Masonry construction holds the lions share (91%) of the market, although it is the technology most under threat. In the last 3 years it has lost 3% market share (some 6,000 units per annum) to other forms of construction. This is a definite trend.

In essence, masonry construction refers to the structural wall construction of the building. This is typically a cavity wall approach, comprising a brick outer skin, a 50-60mm cavity with a *blockwork* inner leaf which is then finished internally with a gypsum based drylining or wet plaster. A similar approach is used on multi-storey construction, although these would usually comprise a steel or concrete frame structure that is then infilled with brick/block as before, usually hung on stainless steel angles at each floor level.

The key reasons why block construction is facing increased competition in the UK are;

- *Skill shortages* – the collapse of the construction sector in the early 1990's removed around 1/3rd of the personnel employed in the industry. Demand for skilled labour is particularly high in London and the South although it is in general a national problem.

- *Labour cost* – The demand for labour has forced the price of skilled workers to a premium that developers and contractors are now reluctant to pay.
- *Weather dependent* – Construction in block work involves a *wet* trade which are adversely effected by inclement weather, making forecasting programmes unreliable, particularly in the winter months.
- *Quality* - The skill shortages and demand highlighted here are also factors that directly impact on the quality of the built product.
- *Speed* – Block construction is generally slower (NHBC figures suggest timber frame is between 15-30% quicker). This impacts on the preliminary (fixed) costs for schemes.

The final reason, and perhaps the most significant, is the Governments desire to see improvement in the construction sector (discussed at 2.4). This has created an impetus for developers, designers, contractors and particularly the RSL's to question the strongly held myth that consumers don't like anything but *traditionally* (read - brick and block) constructed homes.

The key benefits of masonry are;

- *Speed* – whilst slower to construct, this potential minus is turned to a plus by the fact that builders can start on site immediately (timber frame has a typical 4-6 week lead time. It is therefore, more forgiving of poor programming.
- *Cost* – Masonry construction is currently the cheapest form for house construction in the UK (typical estimates will show between 2-5% cost adva ntage).

Timber frame

There are three key systems in use in the UK. Open panel, closed panel and *volumetric*. Collectively, they have a market share of around 8%.

	Number of starts	% timber frame	Number of timber frame units (1999)	Estimated increase on 1998
England	146,100	3%	4500	1500
Wales	9,300	6%	560	300
Scotland	21,000	43%	9030	500
Northern Ireland	10,600	2%	210	100
TOTAL Timber frame	**187,000**	**8%**	**14,300**	**2,400**

Table 24: Timber frame market share for the UK

Figures for the first quarter 2000 suggest the market for timber frame is still improving strongly with England showing 4% (2% first quarter 1999), Wales showing 5% (4%) and Scotland showing a 52% (42%) market share. The table below presents a picture of timber frame use across the regions in England:

	Number of starts	% timber frame	Number of timber frame units	Estimated unit increase on 1998
England comprising:				
North East	7,100	1%	70	No change
North West	14,800	1%	150	No change
Merseyside	3,100	2%	60	No Change
Yorkshire & Humberside	15,400	1%	150	75
West Midlands	15,100	2%	300	175
East Midlands	15,600	1%	150	No change
Eastern	19,300	3%	580	No change
South West	14,800	5%	740	600
Greater London	**15,600**	7%	1050	No change
South East	25,100	5%	1250	650
TOTAL Timber frame	**146,100**	**3%**	**4500**	**1,500**

Table 25: Timber frame market share by region in England

The type of home does not appear to materially effect the choice between timber frame and masonry construction with the exception of the bungalow market. Here timber frame has around 20% of the market (compared to 8-9% overall).

Timber frame system types

1. Open Panel (Conventional Platform frame)

This system and has a 35-year track record of mainstream use in the UK market. It performs well against all types of measure and NHBC statistics would suggest extremely low claims ratio in respect of defects. The panels are made 'open' (i.e. sheathing material to one side only) on one side to receive insulation on site and are 'closed' by the drylining material. The panels can be delivered in large or small panel format for hand or crane erection. Floors are most commonly supplied as cut to length timbers and assembled on-site in much the same way as with masonry construction. This system probably accounts for 85%+ of timber frame used in the UK. The general build up of a platform frame is shown below.

Illustration 1: Platform frame exploded view

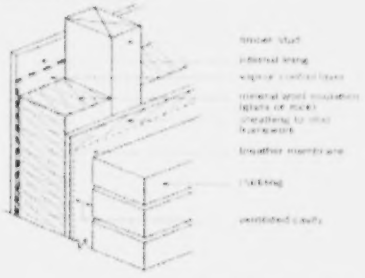


Illustration 2: Platform frame wall section

2. Closed panel systems

Here the insulation material is installed into the panel in the factory and this is then retained with some other layer of material to 'close' the panel. Closed panel systems generally allow more value to be added in the factory but often require service runs to be pre-planned. As they are also heavier, they tend to require crane erection on site. The illustrations here shows a generic type often referred to as *breathing wall*. 'Breathing' in this context, relates to water vapour diffusion. In essence, *all* timber frames breath to avoid interstitial condensation. Here however, the vapour control layer is incorporated into the plasterboard as a backing and the soft, or medium-board outer sheathing does not require an additional breather membrane as found on conventional platform frame. It is estimated than around 1000 units per annum are produced in this way.

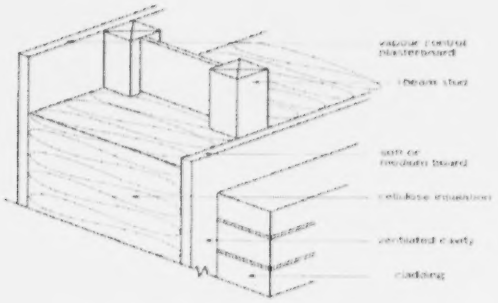


Illustration 3: Closed panel wall section

3. 'Volumetric'

Here large elements of the structure are assembled off-site to form typically whole rooms. These can be complete to include all furnishings, carpets and fittings, etc and are craned into position on site where final connections for services are made. Rooms are typically no more than 3.6 metres wide due to transport restrictions. This system is currently used primarily in

the commercial hotel sector for it's speed of erection, but is also starting to appear in the housing projects for the social sector on a few schemes.

Illustration 4: Volumetric (whole-room) construction

The volumetric approach is also being trialled in relation to the provision of pods for kitchens and bathrooms.

4. Other systems

Until recently, there would have been scant material to put in this section. The Governments drive for prefabrication and the Housing Forum Demonstration projects schemes have alter this picture. Systems currently in are:

Steel frame – A number of developers and RSL's have been involved in trails of steel frame. In general these are *stick-built* systems which are then insulated with a rigid insulation on site. It is estimated that around 400-600 units were constructed in 1999. Other approaches include that of Britspace, who have developed a modularised system (same technology as they use for McDonald's drive-through's) which offers a 3week manufacturing time and two weeks on-site construction period. The total UK production capability is thought to be around 1000 units per annum for all steel frame. Key players are Surebuild, Britspace and Metsek.

Concrete tunnel form – several RSL's have used this form of construction in 1999, the most notable being the Nightingale Estate project. Here, separating walls and floors are constructed from concrete using the Tunnel-form method (reinforced in-situ concrete using reusable shutters). The elevations are then infilled with timber frame panels and masonry clad. It is estimated that around 100 units were constructed in 1999.

Quickhome – A pre-cast concrete housing system that includes integrated foundations from the Roger Bullivant group. Around 100 homes are in planning.

Hemp/lime – a scheme of 18 units is underway using hemp and lime around a timber frame shell.

Polystyrene/concrete – a trial site of 6 units has been constructed by a developer in Nottingham. This included a concrete basement system.

2.3.2 Trends in timber construction

For the UK market, the are 3 key trends emerging;

1. Prefabricated floor construction
2. Prefabricated roof construction
3. Closed panels

Pre-fabricating the floors into panels in the factory (called *cassettes)* and delivering them for crane erection as with the wall panels is not a new idea yet it is attracting a good deal of support from developers and manufacturers alike. These cassettes typically comprise the floor joists, and decking material, but can also include insulation and drylining to the ceiling side. With compartment floors for flats, these are then finished on-site with a *floating floor* to provide the improved acoustic barrier. When combined with engineered wood products like I beams, *clear span* floors of over 6 metres can be readily achieved, allowing complete freedom over internal layouts and future adaptability. This is the primary interest for RSL's who have a long-term interest in the flexibility of use of their stock. As laying a site-cut floor can take ½-1 day for a single home, these cassettes can offer dramatic productivity improvements and are the key reason for developer interest. Two of the top 5 manufacturers already produce this product and the new Torwood factory will purportedly also produce panellised floor system. Licence holders of the TRADIS system already produce these floors in closed panel format.

Roofs are traditionally the same for all forms of construction i.e., truss based. Over the past 25 years this form of prefabrication has become the norm in the UK and site-cut roofs are only seen on the most complex of structures. Whilst the truss roof system is efficient and economical to construct, they do largely prevent future access to this space. With developers looking to maximise land values and RSL's being encouraged into *future adaptability* innovative ways of using this space are currently appearing. *Attic type* trusses are the traditional solution but roof cassettes are also becoming a more common sight, enabling faster watertight construction times and allowing complete access to the roof space.

Closed panels are being adopted by a number of major clients in their programmes. From their perspective, it makes sense to simplify the on-site construction process by moving the activity off-site. Whilst this can dramatically increase the factory gate value of the product for the manufacturer (by a factor of 3 if windows, doors and lightweight claddings are included) it is not something they are keen to embrace. Their factories are not geared up to turn and handle closed panels and they require a more multi-skilled workforce. Designs also have to that much more complete prior to manufacture to enable accurate service integration. A further advancement of the closed –panel system is shown here;

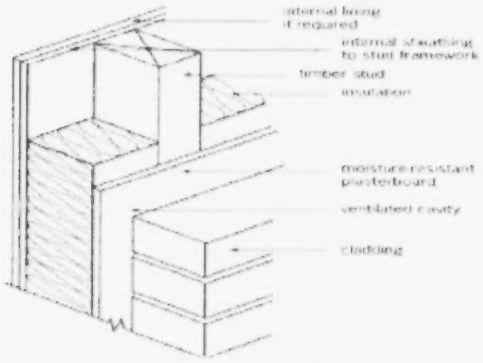


Illustration 5: Closed panel reverse-wall

This illustration shows the latest development in timber frame panels – a reverse wall. Here the structural OSB sheathing moves to the inside face to improve robustness (rather than just acting in a structural capacity externally) and also acts as a vapour control layer. The external material can be moisture resistant plasterboard, medium board or soft-board, or even a breather membrane, dependant on the application (i.e., if factory fitting cladding, a breather membrane would provide a low-cost solution). Both systems are compatible with all external claddings.

It seems clear that the trend is towards greater off-site prefabrication and reduction in site work. This seems to be attractive to developers as in the last three months 3 major UK

developers have enter or extended their commitment to off-site production. Prestoplan, England's largest producer has been purchased by Wilcon Homes with the intention of servicing up to 40% of their 4000 unit programme. Beazer have opened a new facility capable of producing around 2000 units which will be operational this year (in addition to their Scottish operation which produces 1400 units) and Westbury homes have announced a planned £10 million investment in a new panellised housing product to be based in the midlands.

2.3.3 Major domestic firms

The UK has a well-developed infrastructure in timber frame production. Predominantly Scottish based, around 75 firms are active in the market. The majority of these are small producers building for the self-build market. Estimates suggest that at current levels, the UK has a production capacity for housing in the order of 20,000 –25,000 homes[15]. If the market continues to expand at the rate seen in the last year, the UK will reach capacity (of existing facilities) within 24 months. The key players with estimated production of over 300 units per annum are highlighted below:

	Company	Location	~ Capacity
1	Stewart Milne	Aberdeen	2,500
2	Walker Timber Group (includes Guildway)	Edinburgh (Boston)	1,800 (1,000)
3	Prestoplan	Preston, Lancashire	1,500
4	Torwood Homes Torwood Homes 2 (operational 4th Quarter 2000)	Edinburgh (Ipswich)	1,400 2,000+
5	Potton Homes	Bedfordshire	800-1000
6	Pinewood Structures	Bedfordshire	750
7	Scotframe	Aberdeen	6-800
8	MTE	Leicester	4-600
9	Oregon Timber Frame	Roxborough	300-400
10	Alpha Timber Frame	Guildford	
11	Avon side	Glasgow	
12	SL Timber Systems	Glasgow	400+
13	Kildonnan Homes	Sterling	250-300
14	Frame Home South West	Cornwall	3-500

Table 26: UK leading timber frame producers.

A manufacturer that produces over 800 units per annum will have the following profile:

- A 40,000– 60,000 facility on a 6-acre+ site.
- Employ around 40-50 production staff.
- Operate 3-4 production lines.
- Have one line that it computer controlled – the remainder being manual.
- Provide a basic platform frame product based on 89mm studs and OSB sheathing.
- Normally use solid timber for joists but will also be using I-beams on an increasing scale.
- Buy in trusses from other manufacturers.
- Use CAD and linked estimating software.
- Work 1-2 shifts during the summer months.
- Operate partnering agreements or framework agreements with 2-3 core clients.
- Commit less than 10% of production to one-off self-build housing.
- Commit around 20% of production to non-residential work.

Major foreign competition

Currently, there are few overseas firms operating in the UK and those that do will have a 1-20 unit share in terms annual import to the UK. As mentioned earlier, the collaboration with overseas firms tends to be on a demonstration project basis, prototyping a technology in the UK market. Around 5-10 firms primarily from Holland (concrete) and Sweden & Finland (Timber frame) have schemes in the UK. However, a number of major producers have

[15] The total UK capacity is estimated at ~40,000 units but this includes commercial projects like hotels and barracks.

explored the UK market and are likely to appear over the coming years. The 2 key players are defined below:

Ireland Century Homes are the largest timber frame producer in Ireland. Based in Monaghan they are a major producer with a capacity for around 15-1,800 units per annum. Mostly they supply into the Northern Ireland market, but have been known to supply to Scotland for specific clients. They have new facilities, have invested heavily in new manufacturing technology and have expanded aggressively during the last 4 years.

Sweden – Skanska Bodaster AB have taken a strong interest in the UK market over the last two years. They have 3 timber frame factories in Sweden with a capacity for around 4,500-5,000 units per annum. As joint developer of the IKEA Bo-Klok life-style concept house, the UK is one of three markets they are anticipated to enter during 2000/2001.

A number of Japanese firms have looked at the UK market. However, until there is some harmonisation of the codes within the wider European market, there seems little incentive to enter such a (relatively) small market. To date, there has been little evidence of Canadian prefabricated housing in the UK markets.

2.4 Major challenges facing UK Housing

2.4.1 Background

Over the last decade, two key factors have emerged which point to the need for radical change within the business culture of the construction industry. Firstly, the emergence of technologically complex components (air conditioning, cladding, communications, framing systems, etc.) that now dominate construction costs, have forced a paradigm shift from site construction using a skilled contractor labour force, to specialist contractor assembly of off-site manufactured products and components. This level of industrialization has led to the introduction of a diverse range within the parts set. Consequently, a variety of procurement techniques to manage the increasing complexity of construction have been developed. Secondly, clients are placing considerable pressure upon the industry to radically improve its performance, in terms of value for money, flexibility and certainty. The focus on these issues was polarized by the publication of the Latham Report, the most wide-ranging Government review of the construction industry since the 1960's. This pressed home the need for root and branch reform in the management of the UK construction industry[16]. It also recognized the chronic skill shortage in UK construction and the weaknesses inherent in the training and education system. It is therefore, widely acknowledged that it is imperative to analyze and re-define the way in which the industry is coordinated, integrated and structured.

More recently, the Egan report[17] highlighted the role that prefabrication, partnering, benchmarking and ***learning from abroad*** could play in improving the performance of UK construction and identified a number of KPI's and set scope for improvement targets. It also suggested that the Social housing sector should be used by the Government to lead change in the construction industry. It recommended the establishment of a Housing Forum and that separate money should be allocated to the production of innovative homes. It proposed 5 drivers for change and 4 priorities for change as below:

Drivers of change	Priorities for change
1. A focus on the customer	1. Product development
2. A quality driven agenda	2. Project implementation
3. Committed leadership	3. Partnering in the supply chain
4. Integrated processes and teams	4. Production of components
5. Commitment to people	

Table 27: Drivers & priorities for change in the Egan programme.

Egan also recommended 7 targets or Key Performance Indicators (KPI's) for construction:

[16] Latham M. Constructing the team, HMSO, 1994.
[17] Egan J. Rethinking Construction, August 1998. HMSO.

1. *Reduce costs by 10% per annum*
2. *Reduce construction time by 10% per annum*
3. *Reduce defects by 20% per annum*
4. *Reduce accidents by 20% per annum*
5. *Increase predictability by 20% per annum*
6. *Increase productivity by 10% per annum*
7. *Increase turnover & profits by 10% per annum*

The Government, via the Housing Corporation, is putting increasing pressure on the RSL sector to lead this change and ensure new build housing is 'Egan compliant'. As a consequence, they have indicated that by the year 2003/2004 their entire Social Housing Grant (SHG) allocation will be 100% Egan compliant. They have also proposed 9 *key proxies* for Egan Compliance which are:

1. Housing Forum membership www.thehousingforum.org.uk
2. Constructionline membership www.constructionline.co.uk
3. Use of Housing Quality Indicators www.detr.gov.uk
4. Benchmarking www.cbpp.org.uk
5. Use of innovative working groups and alliances
6. Partnering
7. **Standardisation and pre-assembly**
8. Use of HQI targets for projects
9. Housing Forum demonstration project status

2.4.2 Pressure points

Following the Egan report, the private house building sector has been under increasing pressure to improve its performance. This has created an environment where there is a thirst for new ideas, to enable firms to differentiate themselves from the competition. Key pressure points for this market differentiation are seen as:

- Quality (in terms of finished product)
- Cost (capital cost)
- Choice (consumer choice)
- **De-skilling site** **(increasing off-site manufacture)**
- Consumer view (are new products particularly external finishes acceptable?)
- Planners view (will planners accept the products?)
- Availability (Are the manufacturing arrangements sufficient to meet demand?)
- Reliability (can the suppliers *consistently* meet their needs?)

Currently, the Housing Corporation have indicated in the 1999 *guide to the allocation process* (annex D), that by the financial year 2003/2004 the entire construction element of the Corporations ADP funding will be Egan compliant. So by contrast, the social housing sector have been provided with clear *incentives* to change but;

- Have scant understanding of new technologies *(standardisation and pre-assembly)*
- Have concerns over accountability of *partnering* for compliance audits
- No experience for *benchmarking* and key Performance Indicator monitoring.
- Do not know their *current* performance (benchmarks) in terms of Egan KPI's.

In effect this means that all the 563 housing associations and the 357 local authorities in England and Wales face a steep learning curve in the following areas;

- The drivers for change
- The priorities for change
- The mechanisms for change (the 9 identified 'proxies')
- The monitoring of change
- The impact of change on their own organisations

The nature and extent of the challenge is evident: 1000 organisations need to be enabled in the change management process required and demanded for Egan compliance.

2.4.3 Government policy

Government policy in relation to house construction within the remit of the Department of Environment, Transport and the Regions (DETR). "The aim of DETR is to improve the quality of life by promoting sustainable development at home and abroad, fostering economic prosperity and supporting local democracy." DETR have 10 core objectives:

1. To protect and improve the environment, and to integrate the environment with other policies across government and in international fora.
2. *To offer everyone the opportunity of a decent home and so promote social cohesion, well-being and self-dependence.*
3. To promote efficient and integrated transport services across different modes and reduce road traffic growth, in order better to meet the mobility needs of the travelling public and industry.
4. To deliver regulatory and other transport services to the public and industry and to collect taxes efficiently and fairly.
5. To enhance opportunity in rural areas, improve enjoyment of the countryside and conserve and manage wildlife resources.
6. To create a fair and efficient land use planning system that respects regional differences and promotes development which is of high quality and sustainable.
7. To promote a system of elected government in England which responds to the needs of local communities.
8. To enhance economic development and social cohesion throughout England through effective regional action and integrated local regeneration programmes.
9. To ensure an efficient market in the construction industry, with innovative and successful UK firms that meet the needs of clients and society and are competitive at home and abroad.
10. To improve health and safety by reducing risks from work activity, travel and the environment.

There are 4 directorates that have a role in housing. Policy Objective number 2 is the specific remit of the Housing Directorate. **The Housing Directorate** consists of six policy divisions dealing with local authority housing; Registered Social Landlords (RSL's) and private finance; homelessness and housing management; housing renewal; the private rented sector; and housing policy and home ownership, plus three professional divisions dealing with research, analysis and evaluation; housing data and statistics; and housing and urban economics. It is also responsible for overseeing the Housing Corporation. The Corporation's mission is 'to work to improve people's quality of life through social housing', underpinned by five strategic aims:

- help to revitalise and maintain sustainable housing and neighbourhoods;
- act in the interests of tenants and residents;
- secure the effective stewardship of existing stock;
- safeguard the public interests; and
- encourage innovation and the pursuit of *Best Value*.

The Planning Directorate (PD) is responsible for the system of town and country planning which regulates land use and development. The aim is to create a fair and efficient system that respects regional differences and promotes high quality, sustainable development. To achieve this, the Directorate prepares national planning policy guidance, comments on regional guidance and advises on specific significant planning cases.

Environment Protection Strategy Directorate (EPSD) is the central co-ordinating Directorate for the Group. It looks across the Government's environmental policies as a whole and provides economic and statistical advice and analytical support to the whole Group. It is

the base for the Sustainable Development Unit that is responsible for promoting *sustainable development* and for the *Greening Government* programme.

Finally, the **Local Government Directorate** (LGD) deals with the general powers and structures of local democracy, including standards and central/local relations, and the sponsorship of such bodies as the Audit Commission, the Local Government Commission and the Local Government Ombudsman. It also oversees the statutory framework for improving the quality and cost effectiveness of local government services, including the replacement of compulsory competitive tendering by a **'best value' regime**, and oversees the Local Government Pensions Scheme.

The best value regime is a significant policy shift from the previous Conservative Government to the current Labour administration.

- Best Value is about the delivery by local authorities of high quality, efficient services that are responsive to the needs and aspirations of local people - the service users.
- From 1 April 2000 a new duty of Best Value will require local authorities to make continuous improvements in the way they exercise their functions, having regard to economy, efficiency and effectiveness. Best value applies to all council service functions, including housing.

The statutory framework for Best Value requires local authorities to:

- agree a programme of Best Value Performance Reviews of services and set this out in an annual Best Value Performance Plan (BVPP) - the first BVPPs must be published by 31 March 2000 and by the same date in subsequent years;
- undertake Best Value Performance Reviews of all services over a five year cycle. Reviews need to embrace the "four Cs";
  - **challenge** - why and how a service is being provided
  - **compare** - with the performance of others across a range of relevant indicators, talking into account the views of service users and potential suppliers
  - **consult** - local taxpayers, service users, partners and the wider business community in the setting of new performance targets
  - **competition** - consider fair competition as a means of securing efficient and effective services.

The *Best Value* approach also provides for a strengthened external audit and inspection regime. For housing, this is in the form of a new Housing Inspectorate that will form a distinct and recognisable arm of a Best Value Inspectorate within the Audit Commission.

The Best Value in Housing (BVH) Framework document provides local housing authorities with guidance on how the statutory framework for Best Value applies to their housing functions and highlights important issues to consider. As such it provides a commentary on, and is set within the context of, the overall (service-wide) framework and guidance for Best Value. Guidance on the application of Best Value to housing is contained in the Best Value in Housing Frame document which is available from DETR (http://www.housing.detr.gov.uk).

2.4.4 Government initiatives

Currently there are five major initiatives underway. These are;

1. Housing Forum '*JD Power*' survey of house builder performance
2. Housing Forum Benchmarking club
3. ZETHUS Centre
4. Housing corporation 'Top-Slice'
5. Kick-start programme

Housing Forum National Customer Satisfaction Survey

The Housing Forum has been charged by the Ministerial Steering Group to bring forward some comparative form of presentation for the performance of housebuilders based on an annual customer survey. The survey aims:

- To help consumers make a more informed choice when buying a new home and provide information that will assist housebuilders to improve their products and service.
- To provide an annual Benchmark of trends in customer satisfaction with housebuilders performance.

The survey will encompass five key themes:

- Value for Money
    - Standard of Finish
    - Quality of fixtures and fittings
    - Defects that need to be rectified by the Housebuilder
- Quality of the Product
    - Perception of whether it represents good value for money
- Customer Service
    - During the Buying Process
    - Moving in Day
    - After Sales Service
- Design
    - Suitability of the d esign for their needs overall.
    - Satisfaction with amount and use of space.
- Overview
    - Whether would recommend their housebuilder to others

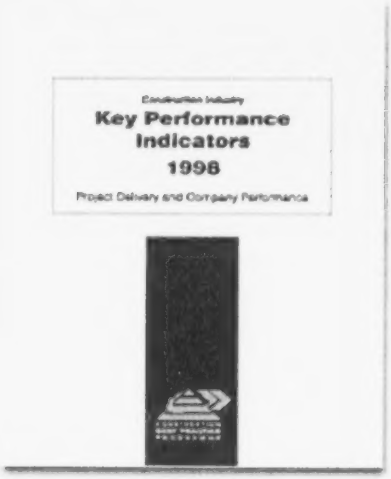
The first results of the survey are expected to be published by the Autumn 2000.

Housing Forum Benchmarking Club

The Rethinking Construction Report, from which The Housing Forum was born, refers to the need for the construction industry to **continuously improve**. In order to demonstrate this improvement, performance needs to be measured. Best practice, benchmarks, and benchmarking tools have been successfully used within other manufacturing industries for over 30 years to monitor and improve business performance. The first known UK benchmark exercise within the construction industry was conducted by Slough Estates during the 1970's. Further studies followed, Freeman[18] summarised the comparative studies of UK and USA construction industries up to 1983 and concluded that it was possible to build faster in the USA than in the UK. The Latham Report cited cost differences between the USA and the UK, where *'the cost of producing a typical US office building in North Carolina to be 32% lower than in similar buildings at Heathrow.'*

The Housing Forum is looking to it's demonstration projects and members to begin this process of embracing measurement. By doing so, they should be able to plot their progress not only within their own organisations, but also to compare themselves with the rest of the housebuilding industry, allowing them to find their strengths and weaknesses, and also to allow the possibility of analysis and action from the results.

[18] Freeman I. USA/UK comparisons: A review. BRE, Garston, 1983.



There are two sets of indicators chosen by the KPI working group as most useful (on a national scale) to the Housing Industry and the objectives of the Rethinking Construction movement. These indicators are the industry wide CBPP/DETR Key Performance Indicators, and the Housing Corporations Housing Quality Indicators (HQI's). Demonstration projects are looking at additional indicators (such as those for sustainability), and these will be voluntarily collected. A **Benchmarking Charter** provides the framework for the Housing Forum's benchmarking objectives.

The ZETHUS Centre

ZETHUS -*Zone for Education and Training in Housing Using Systems*, is a joint venture supported by the DETR and industry. It is located on the Greenwich University campus at Dartford and comprises a **centre for demonstration, seminar and research purposes on housing systems**. It will run DETR sponsored workshops for around 2000 decision-makers from the housing sector per annum focused on promoting off-site prefabricated housing systems.

ZETHUS has an exhibition area to display innovative product developments and space for seconded staff to learn the new technologies in detail. The main demonstration area is the **Global Village,** a site of 8 'show-houses' each constructed from a different technology to illustrate best-practice in off-site manufactured housing systems. Overseas firms are being actively encouraged to participate in the centre activities.

Illustration 6: The ZETHUS Centre on the Greenwich University campus, Dartford.

Zethus is currently forming a number of **client clubs** (of which AMPHION is the first) to explore each technology that is demonstrated on the global village over a three year period. Organisations interested in participating should contact ZETHUS at spalmer@ukonline.co.uk. The ZETHUS centre is currently under construction and is forecast to open 4th Quarter 2000.

The Housing Corporation 'top-slice'

As a measure of the Government's commitment to the housing change process, the Housing Corporation has this year, allocated 20% of the funding available to projects that demonstrate *Egan compliance*. These include a large number of projects using frame technology (Note: almost half the Housing Forum Demonstration projects use timber frame). Next year the figure increases to 30%, 60% the following year and 100% compliance by 2004.

This project funding is bid for annually (in October) with selected schemes being funded to start from April the following year. Bids are prepared and presented by housing associations, often in partnership with contractors, developers and manufacturers. Access to the programme is via the individual Housing Associations.

The Housing Corporation Kick-start programme

In May 2000, the Housing Corporation launched a major new initiative – the kick-start programme. This programme, aimed directly at manufacturers, will identify a small number of prefabricated timber and steel frame suppliers. The selected firms will then be included in this years *Guide to the Allocation process* for prospective bidders to chose to partner with the shortlisted firms. The Housing Corporation will then commit **up to £80 million** over a two year period to schemes using these systems to promote and encourage investment in the manufacture of these prefabricated systems. The aim of the programme is to:

- Enhance built quality
- Improve supply chain relationships
- Reduce component delivery times
- Reduce construction times
- Increase predictability

It is anticipated that the selected firms will be announced this summer with the first schemes being delivered under the kick-start banner by summer 2001.

2.4.5 Contact points

Trade bodies and institutes

British Property Federation 35, Catherine Place London SW1E 6DY Tel: 0171 828 0111 Fax: 0171 834 3442	**The Chartered Institute of Housing** Octavia House Westwood Way Coventrey CV4 8JP Tel: 01203 694433 Fax: 01203 695110
Members have substantial interests in residential property	The professional organisation for professionals in housing
House Builders Federation (HBF) 82 New Cavendish Street London W1M 8AD Tel: 0171 580 5588 Fax: 0171 323 1697	**New Homes Marketing Board (NHMB)** 82 New Cavendish Street London W1M 8AD Tel: 0171 580 5588 Fax: 0171 323 1697
Lobbying group to promote private house-building in the UK	Lobbying group to improve consumer understanding of new homes
SCOTFI (Scottish Consortium of Timber Frame Industry) TRADA Offices John Player Building Stirling Enterprise Park Springbank Road, Stirling FK7 7RS Tel: 01786 445075 Fax: 01786 474412	**Timber & Brick Information Council** Gable House 40 High Street Rickmansworth Herts WD3 1ES Tel: 01923 778136 Fax: 01923 778136
Scottish trade body for timber housing	England and Wales trade body for timber housing
National Housing Federation 175 Grays Inn Road London WC1X 8UP Tel: 0171 278 6571 http://www.housing.org.uk	**The Chartered Institute of Housing** Octavia House Westwood Way Coventrey CV4 8JP Tel: 01203 694433 Fax: 01203 695110
Trade body for social housing providers	The professional organisation for professionals in housing

Government

Construction Best-Practice programme (CBPp) PO Box 147 Bucknalls Lane Garston Watford WD2 7RE Tel: 0845 605 55 56 Fax: 01923 664690 http://www.cbpp.org.uk	Department of Environment, Transport & the Regions 3HI Eland House Bressenden Place, London SW1E 5DU Tel: 0171 890 5691 Fax: 0171 890 5759 http://www.housing.detr.gov.uk
The governments Construction Best-Practice Programme for construction	Government department responsible for construction, planning and statistics and research on housing
The Housing Forum 108-110 Judd Street London WC1H 9NT Tel: 0171 813 3050 Fax: 0171 813 3060	**The Housing Corporation** 149 Tottenham Court Road London W1P 0BN Tel: 0171 393 2000 Fax: 0171 393 2111 http://www.open.gov.uk/hcorp
Government supported organisation to promote best-practice and innovation in housing	Government body to register, promote, finance and supervise social landlords.
Department of Trade & Industry Regional Development Division 3 1, Victoria Street London SW1H 0ET Tel: 0171 215 2565 Fax: 0171 215 2563	
Government department responsible for UK competitiveness, Import and Export	

Research

Building Research Establishment Garston Watford, Herts WD2 7JR Tel: 01923 664212 Fax: 01923 664089	**Steel Construction Institute** Silwood Park Ascot Berkshire SL5 7QN Tel; 01344 623345 Fax: 01344 622944
The UK's independent research body for the construction and material sectors	Steel sector research organisation with major research programme on steel housing
TRADA (the Timber Research And Development Association) Stocking Lane, Hughenden Valley High Wycombe, Bucks HP14 4ND Tel: 01494 563091 Fax: 01494 565487 http://www.tradatechnology.co.uk/ttl	**The Palmer Partnership** The Clock House Yotes Court Mereworth Nr Maidstone Kent ME18 5JQ Tel: 01622 817107 E-mail: spalmer@ukonline.co.uk
Timber sector research organisation with major research programme on timber housing	Housing innovation consultancy specialising in market research and marketing frame solutions.

Housing Warranty schemes

National House-Building Council Buildmark House Chiltern Avenue Amersham, Bucks. HP6 5AP Tel: 01494 434477 Fax: 01494 728521	Zurich Building Guarantees Southwood Crescent Farnborough Hampshire GU14 0NL Tel: 01252 522000 Fax: 01252 372989
Self-regulatory body for the house-building industry. Warranty provider for around 80% of new build housing.	Provider of building warranty scheme for the housing sector insuring around 30,000 new built homes per annum.

UK Leading developer sites

http://www.pwave.co.uk/pwave/cala/
Information, including house prices, about some of the developments built by this company. Locations throughout the UK.

http://www.ukpg.co.uk/barratt/
Provides an overview of this home builder, which has operations in the UK and worldwide. With financial data and a database of homes.

http://www.ukpg.co.uk/bovis.html
Guide to new home developments built by Bovis in south-west England. Includes type of building, price and number of bedrooms.

http://www.copthorn.co.uk/
Provides an overview of its services in the residential sector, including info on current housing projects. Part of the Countryside Group.

http://www.countryside-properties.co.uk/
Residential property developer providing info on current projects, financial news and data, company policies, press releases, and job vacancies.

http://www.markoliver.co.uk/
London-based building arm of the Merchant Property Group with experience in low-cost residential developments and community collaboration.

http://www.redrow.co.uk/
See some of the new home developments built by this company in the UK. Email for a free brochure.

http://www.taywood.co.uk/aboutus/mn_aboutus.html

Large company involved in large-scale and residential construction, including homes in the UK, Spain, Canada and US.

http://www.ward-homes.co.uk/
Residential property developer located in Chatham, Kent. With information on its current projects and its home moving services.

http://www.wilson-home-builders.co.uk/
Find info on its current residential development projects throughout the UK, including maps and home floor plans. With enquiry form and contacts.

http://www.wimpey.co.uk/
Provides info on this British property developer, including financials, environmental policies, news, and info on its home-building arms.

Other useful contact web-sites

http://www.nihe.gov.uk/
The Northern Ireland Housing Executive web-site detailing information about their activities.

http://www.scot-homes.gov.uk/
The Scottish Homes web-site detailing publications, research activities, news and details about Scottish Homes.

http://www.sustainablehomes.co.uk
Web site for the sustainable homes initiative run by Hastoe Housing Association and funded by the Housing Corporation

http://housingtoday.org.uk/
The web-site for the major social housing 'Housing Today' magazine.

http://www.atlas.co.uk/inside/
The web-site for 'inside housing' magazine.

http://www.housingnet.co.uk
Listing of the UK social housing organisations and social housing resources.

http://www.wmin.ac.uk/Env/CHS/ukhouse/ukhom.html
Web-site for 'UK Social Housing Link'. Site contains links and resources for the social housing sector.

3 Building technology and standards

3.1 Building materials, products and approvals

A typical specification used in the UK by contractors and developers to specify timber frame component supply is attached at annex 2.

3.2 Technical standards

All structures built in the UK must comply with the relevant National Building Regulations. Whilst separate Building Regulations are in place for England and Wales, Scotland & Northern Ireland, substantively they are similar. The England and Wales Building Regulations (1991) comprise the following parts:

Part	Title
A	Structure
B	Fire safety
C	Site preparation & resistance to moisture
D	Toxic substances
E	Resistance to the passage of sound
F	Ventilation
G	Hygiene
H	Drainage & waste disposal
J	Heat producing appliances
K	Stairs, ramps & guards
L	Conservation of fuel & power
M	Access & facilities for disabled people
N	Glazing – materials & protection
Regulation 7	Materials and workmanship

Table 28: England & Wales Building Regulation key elements

An **Approved Document** (AD) detailing methods of conforming to the Building Regulations is available for each part of the BR's. Any new product must either;

- Comply with the Building Regulations or the details in the AD, or,
- Prove fitness for purpose under Regulation 7.

In general terms, this means either;

- British Board of Agrément (BBA) certification (or other European certification)
- Test evidence from a recognised authority
- Historical precedence.

The Building Regulations (BR) are under continual review with recent changes to *Fire safety* and *Access for disabled people* impacting on housing and timber frame. Key elements that are material for the timber frame housing sector include:

	Material points
Part A: Structure	For timber frame, detailed structural calculations are required.
Part B: Fire safety	Recent changes have reduced the effective height of multi-storey timber frame buildings from 20 metres to 18 metres, before a 60-minute fire requirement comes into force (measured from the ground to floor level of the top floor).
Part E: Resistance to the passage of sound	Currently under review. New Regulation due 2001. Current levels are: Party walls (airborne) = 53dB Party floors (airborne) = 52dB Party floors (impact) = 61dB
Part J: Heat producing appliances	Rules regarding distance from *combustible materials*
Part L: Conservation of fuel & power	Currently under review with consultation document due. Anticipated change is a general 'U' value of 0.3 W/m^2K and .25 for certain fuel types.
Part M: Access & facilities for disabled people	Introduced in 1999. Key implications are: • Electrical sockets minimum 450mm from the floor. • Introduction of ground floor toilets • Level threshold details to one entrance

Table 29: Key Building Regulation changes affecting housing.

In the context of structure, timber frame has been the victim of scare stories in relation to durability. Most notably the 'World in Action' programme of 1983. Two large-scale independent stock surveys conducted by the BRE and published in 1993 and 1996 respectively *"found no instances of rot caused by water ingress"*. Since these stories were conducted, all timber in exposed areas (i.e. in cavity), are also preservative treated to ensure additional peace of mind. **The use of preservative treatments in the UK is a requirement of NHBC, Zurich and HAPM alike.**

3.3 Design standards

In addition to the Building Regulation requirements identified above, *all* social housing provision has to comply with the Housing Corporations *Scheme Development Standards (1998)*. In relation to the construction product, these cover the following areas. Where these contain material implications for housing systems these are also highlighted;

Scheme Development Standard	Key features
SECTION 1: Quality of housing	
1.1 External environment	
1.2 Internal environment	
1.3 Accessibility	• Entrance door widths min 800mm • Entrance level WC • Staircase suitable for future adaption for stair lift.
1.4 Safety and security	
1.5 Energy efficiency, environmental sustainability and noise abatement	• Standard Assessment Procedures (SAP) ratings provided for all dwellings. • Restrictions on specifying materials with potential harmful emissions.
1.6 Maintainability	

Table 30: Key features of the Scheme Development Standards.

The SDS's comprise two elements, both of which are self-explanatory:

- *Essential items*
- *Recommended items*

A number of *recommended items* are beneficial for frame construction. For example, *'designs to facilitate future remodelling, use of non-trussed construction, use of full span floors, lightweight frame construction used'*, etc. It should be noted that individual RSL's often adopt a number of the *recommended items* as a standard.

The Scheme Development Standards are currently under review and a new publication is anticipated in August 2000. The SDS's are available from the Housing Corporation and cost £15.00.

3.4 Warranty schemes

Virtually all property constructed in the UK is warranted by one of three insurance organisations, Namely, **NHBC, Zurich Building Guarantees** and **HAPM**. The developer pays fees and the warrantor inspects property at different stages of the construction. Each firm produces their own technical documentation for compliance with the scheme. Warranties usually cover material durability for:

- Structural material – not less than 30 years
- Non-structural materials – not less than 10 years

Established in 1936, the National House Building Council is the independent regulatory body for the UK house-building industry. The NHBC warranty scheme accounts for around 80-85% of all new build registrations. Interestingly, the warrantors are not at all averse to timber frame:

> *"The NHBC inspects and insures many thousands of homes every year. Our claims records actually show that these (timber frame) houses tend to perform better than masonry homes, as more of the dwelling is made under closely controlled factory conditions"* Christopher Mills, Director of Technical services, NHBC.

Zurich Building Guarantees have around a 15% market share. HAPM (Housing Association Property Mutual) offer a bespoke service for the social housing sector. Any product used in the UK will require acceptance by one (or all) of these bodies.

4 Business Environment

4.1 Key issues concerning imported housing and products to the UK

As stated earlier, because of the high level of government interest in the housing sector, it is necessary for new products and systems to demonstrate some contribution towards the government's objectives and desires for the construction industry. In general terms, this means that they must embrace the three core aspects of *sustainable construction, namely,*

- Economic – *commercially viable systems in capital and running cost terms*
- Environmental – *contribute towards CO^2 reduction*
- Social – improve the quality of life for consumers

The general view is currently that timber and other products from sustainable resources can contribute s ignificantly to the above.

To gain a clear insight into the barriers to imported product amongst the UK house building community, a number of surveys were conducted with major developers and RSL's. They were questioned on their key business drivers, primary areas of interest, key concerns about importing, asked their views on other barriers to entry for overseas firms and asked to suggest strategies for entry. The findings were:

Key Business drivers (in relation to product)

- *Kerb appeal*
- Quality
- Cost
- Predictability of delivery
- Capacity to reduce reliance on skilled trades at the site level
- Technical performance
- Maintenance implications
- Lead times

Primary areas of interest

- Alternative frame solutions
- Clear-span floor components
- Alternative cladding technology
- Non-trussed roofing solutions
- Zero-maintenance exterior products
- Manufacturing technology/partnerships
- Exclusive product supply arrangements

Key concerns about importing

- Exchange rates
- Transportation costs
- Being a peripheral supply market (to US a nd home market)
- Capacity to deliver required volumes
- Predictability of delivery
- Service back-up in the UK
- Training of erectors in the UK
- Value of guarantees
- Aftercare support

Other barriers to entry

- Acceptability to planners and building control
- Delays in planning and Building Regulation approvals
- Requirements for NHBC and ZURICH warranty
- Funders (mortgage provider views)
- Certification costs
- Consumer reaction (particularly external appearance)
- Valuers conservative views on *alternative* technology for housing

Strategies for entry

- *Certified* products
- Demonstration schemes
- Partnership and strategic alliances
- Licensed manufacturing in the UK

A few selected comments are provided below:

> *"Similarly, the advancement of alternative cladding technologies to brick skins is hampered by the poor performance and quality of past development practices, particularly in municipal housing, although again there is a fresh drive to provide a range of new housing products with alternative, lightweight, durable external claddings, where UK manufacturers seem slow to pick up the challenge".*
>
> *"Provided that the resulting dwellings are attractive and desirable, there is no intrinsic customer resistance to technology and manufacturing change – indeed, the majority of UK houseowners are largely unaware of construction issues".*
>
> *"It is the case that a house constructed in brick and block, timber or steel frame, will have a similar or identical selling value in the same location, with location and dwelling type largely dictating value".*
>
> *"We have tried timber frame, but it does not stack up financially if we have to cover it with a brick skin and currently their aren't many other options that could be delivered in the volumes we require".*

4.2 Trading relationships

The UK and Canada enjoy a long-standing and important bilateral trading relationship. Nearly 45% of Canadian investment in Europe is in the UK[19]. The desire to deepen and broaden trade relations between the EU and Canada led to the agreement of an EU-Canada Action Plan. At the EU-Canada Summit in December 1998, both sides agreed to develop the trade chapter of the EU-Canada Action Plan by launching the EU-Canada Trade Initiative (ECTI). ECTI is intended to build upon the bilateral and multilateral trading relationships between the EU and Canada. The EU and Canada both strongly support an open and rule-based international trading system.

The 1998 agreement on mutual recognition of conformity assessment facilitates bilateral trade by allowing each side **to certify the conformity of products** with the standards required by the other.

According to HM Customs and Excise;

> *The G7 countries (Canada, France, Germany, Italy, Japan, UK and USA) have been looking at information requirements as part of an effort to harmonise and simplify customs procedures. The elements for Import Declaration, EDIFACT*

[19] figures from US Bureau of Labor and Statistics Canada.

Mapping Standards, Cargo Report and Cargo Release are now more or less agreed. Trade Policy Group (TPG) anticipate that G7 will reach agreement on the necessary elements for Export Control and Export Declaration. Subject to EU approval, this will allow the development of specific Prototypes in mid 2000. Thereafter, once the process of harmonising data elements is successfully completed, work will commence on the harmonisation of customs procedures.

The UK Government are currently keen to encourage trading relationships with overseas firms, particularly in the housing sector, where Egan has identified *learning from abroad* as a key part of the strategy to improve the sector. A range of Government grants is available for overseas firms looking to invest in the UK. These are administered via the Department of Trade and Industry, with typical grants being up to 15-20% of total capital expenditure (Regional Selective Assistance).

On the industry side, all the developers and RSL's surveyed expressed a willingness to meet with overseas firms offering technology that could be used, in volume, in the UK.

4.3 Recommended market entry strategies for Canadian housing companies

This report has highlighted a range of issues that would need to be addressed to create any long-term market for imported housing products to the UK. These include technical issues, regulatory compliance requirements and performance issues in relation to product delivery. It also raised the concerns over the conservative nature of the UK Building Control and planning system (although the later is currently under review). Clearly encompassing all these areas will be an expensive and time-consuming business that will not be concluded over night. Therefore a three-stage strategy is proposed for market entry. This is presented below.

Stage 1: Communication (timeframe 3-6 months)

- External - Understand market and identification of key publics
    - Workshops and seminars with clients
    - Workshops and seminars with designers
    - Workshops and seminars for regulators (define certification need)
    - Workshops and seminars for funders, valuers
    - Workshops and visits with UK manufacturers (component supply/competition evaluation)
- Internal – Evaluate and quantify *commitment* to export
    - Shareholders
    - Key Staff
    - Supply chain
- Develop communication vehicles for the key publics
    - Fact sheets
    - Web library of key firms
    - Education and training modules
    - Secondment of staff to UK firms

ACTION POINTS

1. **Agree budgets and develop 'Canadian' marketing framework for the UK**
2. **Arrange workshops and network visits**
3. **Tailor literature for the UK**
4. **Develop training modules**

5. **Arrange secondment**

Stage 2: Demonstration (3-18 months)

- Project partnership on *demonstration* schemes
    - Network visits with UK firms to agree partnered pilot technology projects
    - Develop schemes and submit for funding (RSL's only – October 2000)
- Partnership with the ZETHUS Centre over a Canadian *show house*
    - Agree partners and measurable objectives
    - Agree finance
    - Develop show home
    - Certification of product (s) using show home as *test-rig*
        - Partner UK/EU R & D to part fund development of UK market
    - Market (via the Centre)
        - Fact sheets
        - Web site link to Canadian firms
        - Participation in workshops
        - Bespoke workshops for individual clients
        - Trade and national press links via centre

ACTION POINTS

1. **Agree targets (say 5 demonstration schemes)**
2. **Agree shortlist of potential partners from workshop follow-up visits**
3. **Commit to show unit in place by December 2000**

Stage 3: Consolidation (1-3 years)

- Disseminate *demonstration*
    - Housing conferences (NHF, Housing Forum, etc)
    - Housing forum regional seminars
    - Trade coverage
    - Submission for trade awards
    - Monitor Egan compliance and publish Egan *Radar* chart
    - Incorporate on web sites
    - Individual company marketing activities
- Develop strategic partnerships
    - Target 1-3 firms (from the developer/contractor market)
    - Consider exclusivity arrangements for major firms (UK only)
    - Consider technology licensing for UK manufacture
    - Evaluate grant opportunities for Canadian manufacturing presence in the UK.
- Expand project partnerships
    - Consolidate learning on individual projects with specific partnered firms
    - Develop *continual improvement regime* on follow-up sites

ACTION POINTS

1. **Identify small group of potential partners (strategic, project, licensing, etc)**
2. **Establish UK presence or marketing partner for long term UK growth**
3. **Expand secondment strategy to include reciprocal placement in Canadian firms**

TIMBER FRAME

PERFORMANCE SPECIFICATION

1. INTRODUCTION

The performance specification given in this document covers timber frame wall panels above dpc level, timber roof elements and other elements normally supplied and fixed by the timber frame manufacturer. All timber frame design, manufacture and erection must comply with the following essential requirements of the building regulations 1991:

- . Structural stability
- Fire safety
- Resistance to weather and ground moisture
- Thermal performance (to Approved Document L)
- Roof ventilation
- Condensation control
- Disabled access (where required)
- Material specification
- Workmanship specifications

Where the timber frame is other than conventional wall panels (as illustrated in the TRADA manual 'timber Frame Construction) and trussed rafters, the designer should submit a written statement of how the essential requirements will be met. The structural designer should submit a written statement to illustrate how all vertical and horizontal loads will be resolved.

The timber frame fabricator should submit a statement of the quality procedures the company employs for the design, manufacture and erection of the timber wall, roof and floor elements. A company profile and brief CV of key personnel should be submitted.

All timber frame wall panels must be manufactured off-site in dry factory conditions to at least the level of sheathing and studs and top and bottom rails with a breather membrane factory fixed (where required) and taped for wall tie location.

The timber frame manufacturer will be expected to be responsible for the site erection of the wall panels, floors and roof up to weathertight stage.

The requirements contained in this specification cover the majority of timber frame construction forms currently being employed. This does not preclude other more innovative or unusual construction forms, although these will require appraisal by expert third parties prior to approval.

This document should be read in conjunction with all relevant design drawings and additional specification notes supplied by.....

2. STRUCTURAL DESIGN

The robustness of the internal face of the external wall is a particular concern for the client. The contractor shall be required to provide a design solution where the drylining alone is not the only barrier to the structural frame. Reverse wall type designs could meet this criterion i.e., where the structural panel product is fixed internally, directly behind the plasterboard. The OSB thickness can be increased internally to improve robustness (rather than just acting in a structural capacity externally). The external material can be moisture resistant plasterboard, medium board or soft-board, or a breather membrane, dependant on the application. The system would need to remain compatible with a wide range of external claddings.

Standard timber frame deigns with alternative room linings or, alternative design solutions may also be acceptable. Any system proposed will require the approval of the employer's agent.

The structural design of wall panels must be in accordance with BS 5268: Part 2 and BS 5268 Part 6: Section 6.1. British standards are referenced throughout but as an alternative, Eurocode 5 can be used.

Trusted rafters (if used) must be designed in accordance with BS 526: Part 3. Other structural roof elements must be designed in accordance with BS 5268: Part 2.

All timber framing structural calculations must be made available for appraisal by third parties (if requested). It is the responsibility of the fabricator to provide designs and calculations that prove the stability and soundness of the structure.

Where stud walls are proposed to kitchens and bathrooms account should be taken of potential future fixing loads. Proposed solution is to be agreed with the employers agent.

3. MATERIALS

All materials used in the manufacture must conform to the relevant standards, or other requirements, as listed below. Evidence may be required to demonstrate that these materials conform to the relevant Standards and specifications. Alternative materials may be permissible provided that they have been independently assessed by an appropriate body as fit for purpose. Materials or components to a relevant BS EN European Standard will also normally be acceptable.

Wall panels must be manufactured using the following materials:

Structural timber – to the grades stipulated in BS 5268: Part 2 and stress grade marked to show compliance with a third party accreditation scheme. Regularised ALS or CLS sizes.

Plywood – WBP or exterior bond quality to BS 6565 or equivalent National Standard and of grade stipulated in BS 5268: Part 2.

Chipboard– type C4A complying with BS 5669: Part 2.

Oriented Strand Board (OSB) – Type F2 to BS 5669: Part 3 or OSB3 or OSB4 to BS EN 300.

Impregnated softboard – SBI or SBS grades to BS 1142.

Medium board – HME grade to BS 1142.

Hardboard– THE grade to BS 1142.

Breather membrane – as specified in the TRADA Wood Information Sheet 1-35.

Insulation – mineral wool (glass or rock), or cellulose fibre capable of meeting the thermal requirements of the Building Regulations and any additional standards identified elsewhere in this documentation in relation to SAP or NHER ratings.

Vapour control barrier – at least 500 gauge polyethylene or a proprietary third party certified 'vapour check' plasterboard. Alternative methods that can demonstrate that the vapour resistance's of materials on the warm side of the insulation are at least 5 times greater than those on the cold side may be considered. In these instances, calculation of the wall condensation risk shall be required.

Lintels – timber and/or flitch beams designed and manufactured in accordance with BS 5268: Part 2.

Hardware – (e.g., joist hangers) all to approved manufacturers recommendations.

Cavity barriers – proprietary polyethylene sleeved mineral wool slabs, or timber at least 38m thick, with mineral wool plugging to close cavity. All timber in the cavity to be preservative treated in accordance with BS 5268: Part 5. Alternatively a construction that could demonstrate compliance using gypsum based boards would be considered.

Fixings – Frame: steel wire or improved nails to BS 1202.
Vapour control layer: wire staples to BS 1202.
Sheathing: sherardized or better corrosion resistant nails to BS 1202.
Breather membrane: Sherardized or better corrosion resistant staples to BS 1202 fixed through PVC tapes at stud positions and all round at fixing centres
Plasterboard nails or screws as defined in BS 8212

Preservative treatment – all solid structural timbers in walls must be treated in accordance with NHBC Standards chapter 2.3.

Roofs shall be manufactured using the following criteria:

Trussed rafter roof – shall be designed and manufactured to comply with the requirements of BS 5268: Part 3. The above operations must be conducted in accordance with an appropriate third party accredited Product Conformity scheme.

Structural timber, plasterboard and fixings – see walls.

Counter and tiling battens – to BS 5534 with fixings to be as stipulated in BS 5534.

Ventilation – proprietary third party certificated ridge and eaves ventilators.

Insulation – see walls (Note: Vapour control barrier only required when insulation follows the line of the pitch or for flat roofs).

Roof underlay – to BS 747 or a proprietary underlay with appropriate third party certification. In pitched roofs where the insulation follows the line of the pitch the underlay must be breathable and have appropriate third part certification.

4. CONSTRUCTION DETAILS

The following list of construction details is the minimum that must be submitted for appraisal. It is expected that these will be prepared jointly be the Designers and the timber frame manufacturer.

PLAN DETAILS

At external wall:

- External corner
- Re-entrant corner
- Panel to panel
- Internal load bearing wall (if applicable)
- Internal non-load bearing wall
- Window jamb
- Door jamb
- Brick skin, including it's attachment to the frame
- All cladding variations with details of joints

Internally:

- Internal walls at right angles to internal walls
- Internal screens (if applicable)
- Internal columns (if applicable)

ROOF DETAILS

- Tank stand (if applicable)
- Access hatch
- Vents
- Truss types
- Bracing or sarking
- Fixing of trusses to wall plates and gables
- Roof finish, battens and underlay

SERVICE DETAILS

- Balanced flue (if applicable)
- Notching and drilling rules
- Pipe detailing through external walls
- Meter boxes
- Electrical socket outlet in external wall
- Special service details as required

SECTION DETAILS

At external walls:

- Ground floor
- Top floor ceiling at gable
- Gable verge
- Eaves
- Eaves at window
- Window head
- Window sill
- Door head
- Door threshold
- Brick skin, including it's attachment to frame and damp-proofing details
- All cladding variations with details of joints

At load bearing internal walls or columns (if applicable):

Ground floor
Top floor ceiling
Internal door head

At non-load bearing internal walls:

Ground floor
Top floor ceiling